JULY, 1924

Railway Engineering and Maintenance

RAILWAY ENGINEERING AND MAINTENANCE
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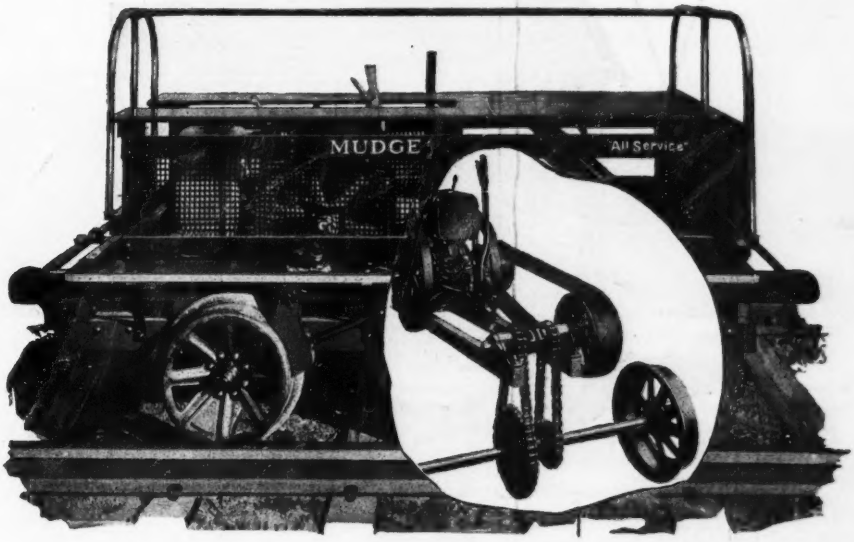

for Extra Heavy Duty

The Mudge "All-Service" Motor Car *with* Two-Speed Transmission

The simplest two-speed transmission ever devised. No gears to shift – or strip. Endless belt – no lacing to fail.

Jack shaft runs in Hyatt Roller Bearings. Gear ratio variations optional. Applicable to any belt drive car.

Plenty of power – as slow as three miles per hour. Ideal for hauling weed mowers. Will do your work on any grade.

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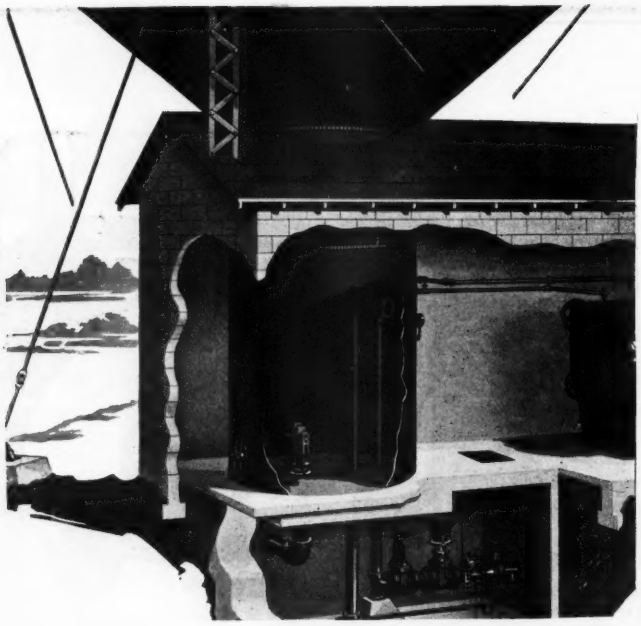

Two Vital Functions

Mixing and Sludge Removal

are Performed in this Area

The **HORTON** conical-bottom is the only tank that collects all the sludge in a small area in the bottom of a riser pipe. By thus concentrating the sludge its removal becomes much more economical—about $400 a year less than when a flat-bottom tank of the same capacity is used. And this is in cost of water alone. The ease of sludge removal and the small amount of attendant's service needed also makes it more economical than other types of tanks.

Economical sludge removal is very important in treating plants. Sludge removal from a **HORTON** conical-bottom tank is so easy that this one feature alone makes it the best tank for softening purposes.

Another Important Advantage

The **HORTON** Softening Plant is the only one which has the very important advantage of having the upper portion of the riser pipe or mud drum on the conical-bottom tank serve both as a reaction and mixing chamber. A distinctive feature is that the precipitated hardness or sludge settling from the treated water above is continually swelling through the specially treated water as the latter moves upward with a slow rotary motion. This accelerates the chemical reaction and also brings the impurities together into comparatively large particles so that the time necessary for complete softening and sedimentation is materially shortened.

The **HORTON** steel tank with its conical-bottom and large riser pipe furnishes this mixing area and sludge removal area ideally. Whether you contemplate water softening plants or are just interested in railway water service you should know about this plant. The simplicity, economy and uniformity of treatment will appeal to any water service man.

Our offices are always glad to give you complete information for your files or for your associates. You can receive this without obligation by writing the office nearest you.

325

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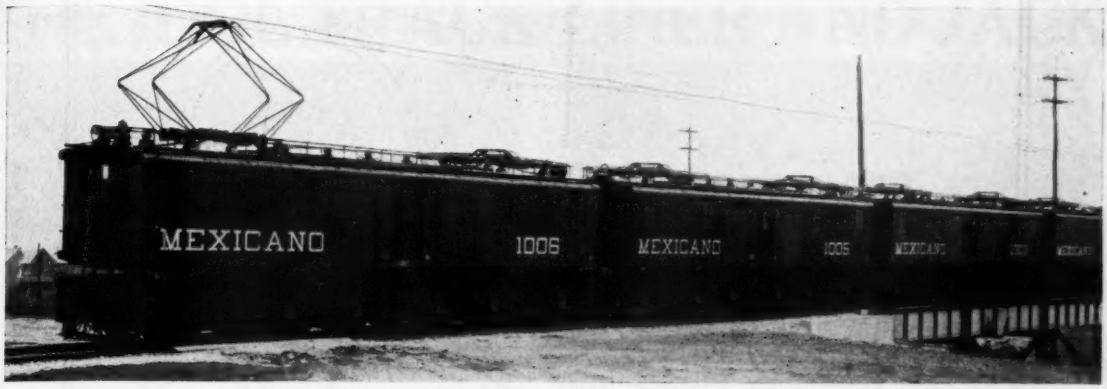
HORTON TANKS



Electric Locomotives Built by the General Electric Company for Use in Mexico

Railway Engineering and Maintenance

Formerly the Railway Maintenance Engineer

Vol. 20 **July, 1924** **Number 7**

TABLE OF CONTENTS

WOULD YOU LIKE TO KNOW

What it costs to protect highway grade crossings?

How to Economize in work train service?

How a suction line was built on an undulating grade line?

What a roadmaster did to get closer to his men?

If rail joints distribute expansion uniformly?

Answers to these and other practical questions will be found elsewhere in this issue.

Published on the last Thursday preceding the date of issue by the

Simmons-Boardman Publishing Company, 608 South Dearborn Street, Chicago, Ill.

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SAN FRANCISCO: 74 New Montgomery Street

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Subscription price in the United States, Canada and Mexico, $2.00 per year; foreign countries $3.00. Single copies, 35 cents. Foreign subscriptions may be paid through our London office (34, Victoria Street, S. W. 1) in £-s-d.

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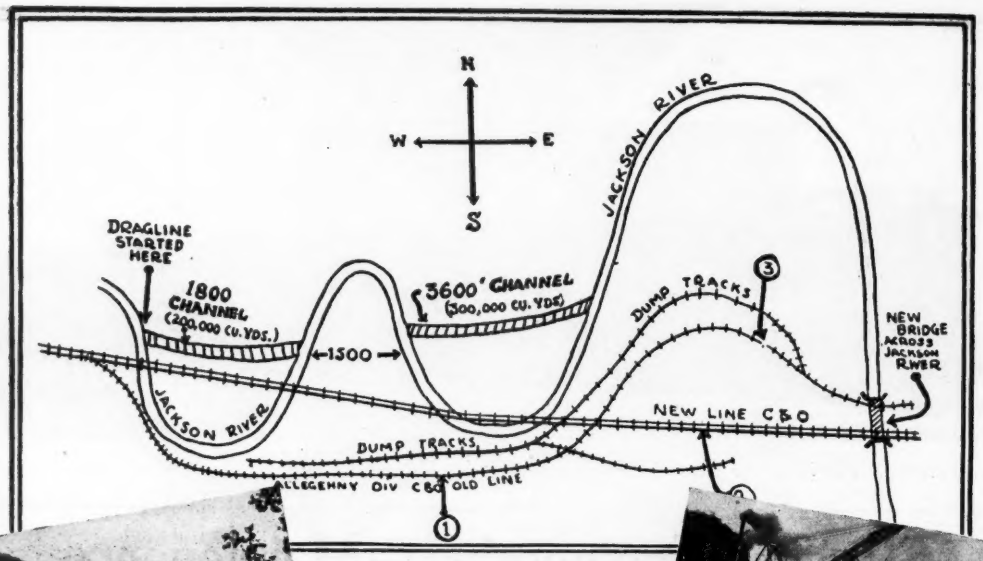
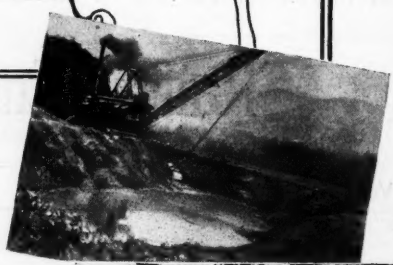


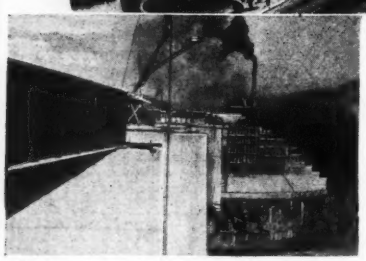
Diagram showing changes under way by Chesapeake & Ohio Railway at Clifton Forge, Va.

1.



3.

Changing a River's Course with du Pont Explosives



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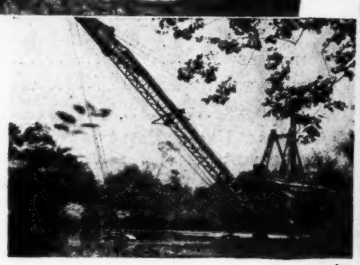

4.

NOWADAYS engineers and contractors think nothing of straightening out the kinks in a river's course or removing a hill or two from one part of the landscape to another.

1. *Dump in Jackson River to make bed for new main line. See Point One in Diagram.*

2. *Operation for 300-foot Jackson River bridge.*

3. *Dragline in operation.*

4. *Dragline mounted on trucks crossing Jackson River.*

But in an operation of this kind at Clifton Forge, Va., the Brooks-Callaway Company, of Atlanta, is undertaking a real he-man's job for the Chesapeake & Ohio Railway. This job was started in April 1923, and will be completed in April 1925.

The excavation work includes about 2,200,000 cubic yards within less than two miles, a reduction in the curvature of the main line, the cutting of 5,400 feet of river channel and the construction of a 24-track concrete bridge 300 feet long. By this operation the present railroad yards will be increased from 43 to 66 miles of track.

The new Jackson River channel is being made with a dragline—about 500,000 cubic yards of excavation. The rock bottom of the channel is blasted to a depth of 7 or 8 feet, and the channel will have a 100-foot bottom and a 1 to 1 slope. W. W. Boxley & Company, of Roanoke, Va., sub-contracted the 30,000 cubic yards of concrete work for the Jackson River bridge.

Du Pont explosives and blasting accessories are being used exclusively, as in hundreds of other important operations throughout the country.

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DU PONT EXPLOSIVES

THE IDOL TRACK LINER AND JACK

Illustration No. 1

Illustration No. 2

Illustrations numbers 1 and 2 show the proper placement of Liners to line frogs. Place three Liners against outside rail in direction of throw, two Liners against frog and two Liners against inside rail. The work of lining can be done with one-third the number of men required when using lining bars. This work usually takes a greater period of time with 15 to 21 men using lining bars than is taken by 7 men when using Idol Track Liners.

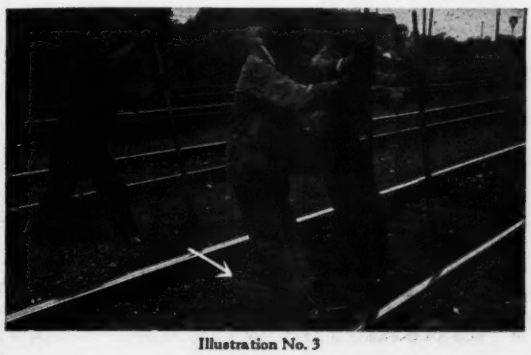

Illustration No. 3

Illustration No. 4

Illustrations numbers 3 and 4 show the lining of ordinary track. Set two Liners against outside rail in direction to be lined, and one against inside rail.

Illustration number 3 shows three men doing the same work with Idol Track Liners as was formerly done by seven to nine men with lining bars. The seven men using lining bars shown in illustration number 4 could not line the track; the three men with Liners moved the same track easily, without digging out the ballast at the end of the ties. When section crews are reduced to three men, all ordinary track can be lined without waiting for the organization of full forces, and without the doubling of section crews.

Illustration No. 5

NOW IN USE ON 70 RAILROADS

THE IDOL TRACK JACK No. 1

Illustration No. 5 shows Idol Track Jack No. 1, which weighs only 26 pounds.

Illustration No. 6 shows man carrying Idol Track Jack, wrench, pick and shovel with ease.

Illustration No. 6

THE IDOL TRACK LINER CO.

Railway Labor Saving Devices

717-723 South Wells St., Chicago, Ill.

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Thos. D. Crowley & Co., Sales Agents, Peoples Gas Building, Chicago

Hope E. Scott & Co., Ltd., Sole Canadian Representatives

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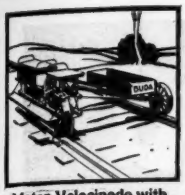

Motor Velocipede with Tool Tray

BUDA
ESTABLISHED 1880

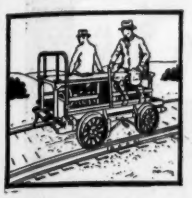
ALL STEEL BUMPING POST

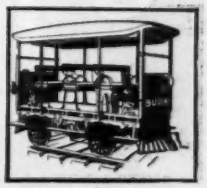
(Patented)

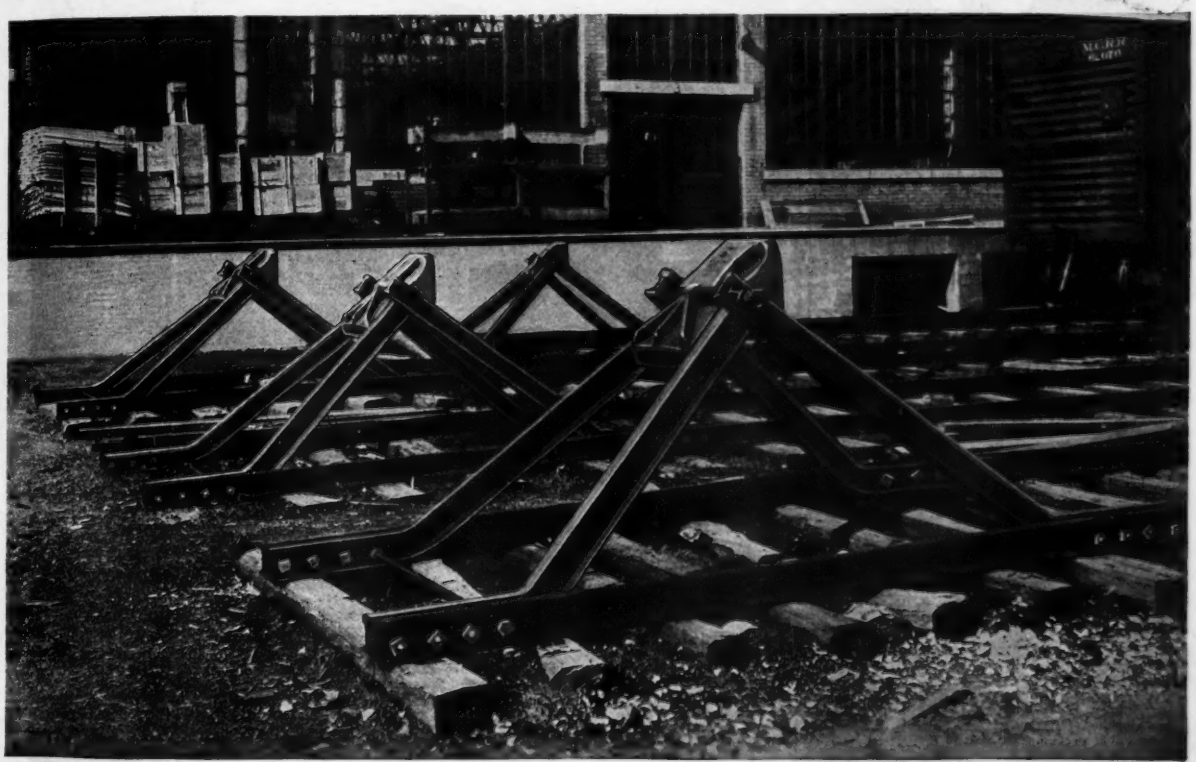
The long angle of rear legs provides resiliency NOT FOUND IN ANY OTHER CONSTRUCTION. The shock of impact is transmitted to the ground with a minimum strain on the front legs and WITHOUT DAMAGE to the post or the equipment.

AN ACCEPTED STANDARD


Ratchet Jacks — Cone and Ball-Bearing Jacks


Railway Motor Cars


Motor Inspection Cars



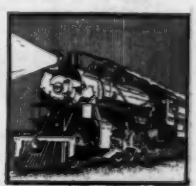
A typical installation of the Buda Standard All-Steel Bumping Post.


Track and Bonding Drills


Hand Car and Liberty Grinders

Low Cost Installation and Maintenance
Shipped Ready to Bolt to the Track
Relocation at Small Cost
Many Thousands in Use Everywhere


Crossing Gates


Electric Headlight Equipment

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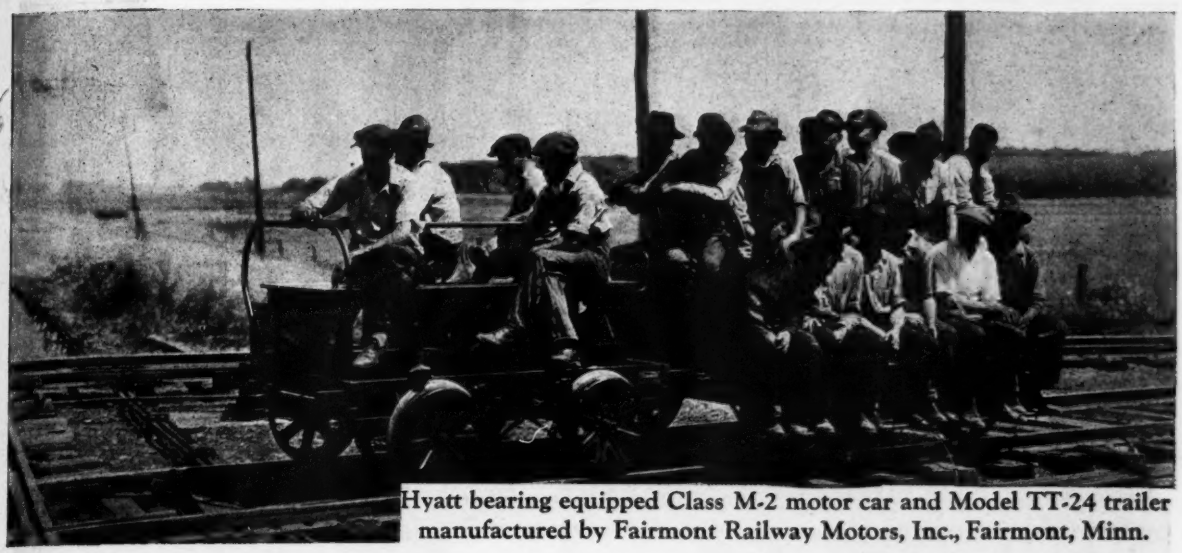


Hyatt bearing equipped Class M-2 motor car and Model TT-24 trailer manufactured by Fairmont Railway Motors, Inc., Fairmont, Minn.

Getting The Gang There And *Back Again*

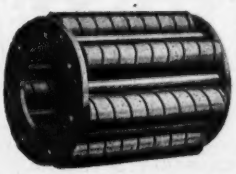
Railway maintenance cars equipped with Hyatt roller bearings have won a reputation for dependable "round trip" service, and for satisfactory performance under the hardest operating conditions.

Fairmont Railway Motors, Inc., appreciating the value to their customers and to themselves of the right bearings, build Hyatt roller bearings into their various models of cars as standard equipment.

Besides the rugged durability and dependability of Hyatt equipped cars they are real fuel and lubricant savers. The elimination of the greater part of friction by the free turning action of Hyatt roller bearings plays a leading part in economical as well as reliable car operation.

When buying new cars be sure that they are Hyatt bearing equipped. When modernizing your old cars equip them with Hyatt bearing replacement boxes for years of additional easy running service.

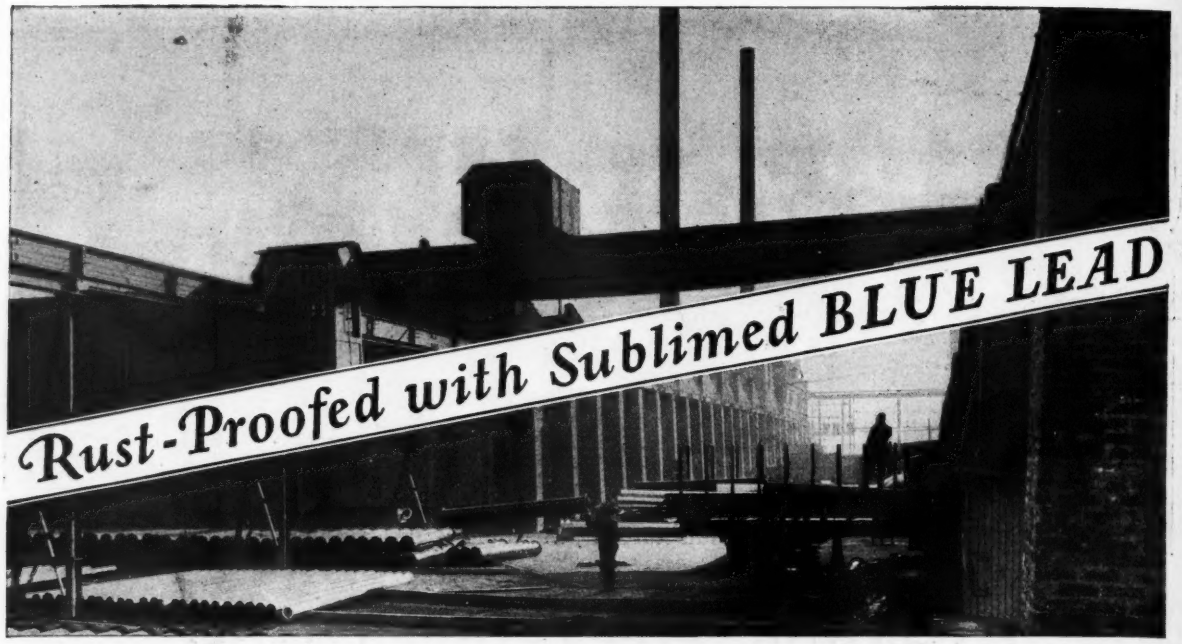
Write for information on the development of Hyatt roller bearings for heavy equipment



HYATT ROLLER BEARING COMPANY

NEWARK DETROIT CHICAGO SAN FRANCISCO
HUNTINGTON PHILADELPHIA PITTSBURGH MINNEAPOLIS
WORCESTER BUFFALO CLEVELAND MILWAUKEE

HYATT ROLLER BEARINGS FOR RAILWAY MAINTENANCE CARS



Traveling Crane—American Spiral Pipe Works

Rust-Proofing with Lead at a Cost of $3.22 per 1,000 Square Feet

Send for your copy of "Fighting Rust with Sublimed Blue Lead"

SUBLIMED Blue Lead in Oil has been rust-proofing the plant of the American Spiral Pipe Works at Chicago for the past fourteen years. By its use this company is getting the undisputed value of a basic lead pigment for rust-inhibitive painting at a total material cost of $3.22 per thousand square feet of coverage.

Exposed to many different conditions, indoors and out, to excessive heat and corrosive gases as well as to the corroding action of the elements, Sublimed Blue Lead in Oil has successfully met every requirement for a rust-inhibitive paint at this plant.

As well, the head painter states that Sublimed Blue Lead in Oil flows from the brush so smoothly and spreads so easily over the metal surface that his painters can cover a greater area in a day, and still produce a paint film that is free from brush marks, breaks, runs, or alligatoring.

One hundred pounds of Sublimed Blue Lead in Oil will rust-proof 5216 square feet of iron or steel of average smoothness. This is equivalent to a surface a foot wide and nearly a mile long. It is practically double the performance of the pigment most used for rust-inhibitive painting.

Have you ever figured your cost of protecting metal per thousand square feet per year? Users of Sublimed Blue Lead find that theirs are exceptionally low, and that the results have been uniformly good under many different conditions.

Send for your copy of "Fighting Rust with Sublimed Blue Lead"—a Rust-Proofing Manual.

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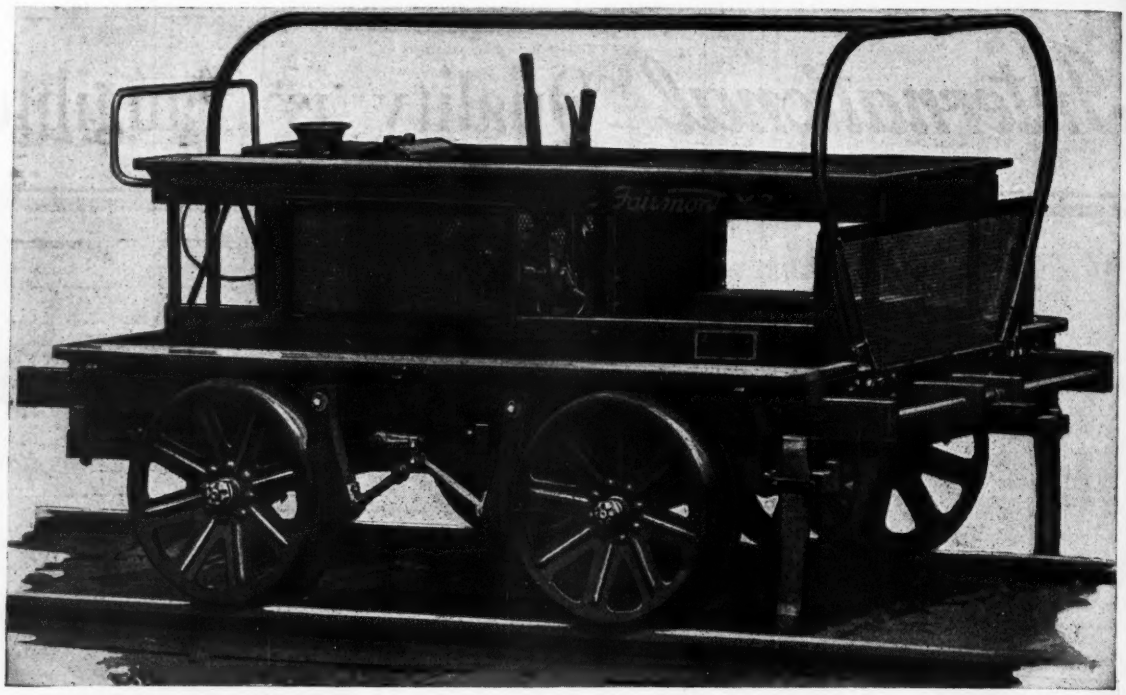

Reasons for Fairmont Leadership and Economy

Three-Bearing Ball-Bearing Crank Shaft

Ball-bearing crank shaft supported on three bearings instead of two. Note how all pulley-*overhang* is overcome by the *third* or end bearing (at right). Holds pulley in perfect alignment. Prevents crystalizing of steel shaft, and breakage. The only safe and wholly efficient crank shaft mounting.

Note These Figures

Time.....July, 1923

Place: Division Transcontinental Railroad

Performance: Forty Class M2 Section Cars perform all the tasks on 40 sections carrying average of seven men and tools and pulling trailers with supplies and material for road-bed. Covered 9600 miles averaging 25.8 miles per gallon of gas.

Cost per 100 miles:

Operation	$0.81
Maintenance	.83
Overhead	1.10
TOTAL	$2.74

Name of Railroad furnished on request

Performance on the Job Counts

Why They Predominate on More Than 700 Roads

Fairmont Railway Motor Cars are being used extensively and in many cases exclusively on more than ***seven hundred*** Railroads of the United States. In every state in the Union, you'll see Fairmonts on the line.

On many of these roads, Fairmonts were first tested out, subjected to every comparative test possible. Costs were kept over a period of time, costs of operation and maintenance. And so unfailingly did the figures favor Fairmonts that wholesale adoption followed as a matter of course.

Fairmonts offer you maximum power, comfort, safety and dependability at the lowest cost per *mile*, or per *thousand* miles, ever recorded. This is due to advanced engineering and to the many points of Fairmont perfection; one being the 3-Bearing Ball-bearing Crank shaft shown above. All details in bulletins illustrating our entire line. Write for them now.

FAIRMONT RAILWAY MOTORS, INC., Fairmont, Minn.

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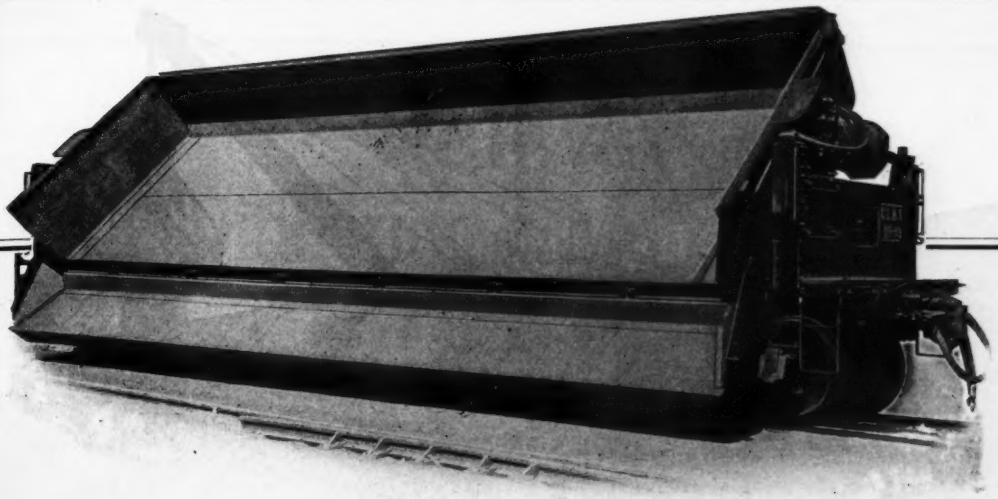
Fairmont

Ball-Bearing Motors and Railway Motor Cars



Judge This Equipment By What It Saves

Substitute Air for Labor

The opening of a small valve dumps immediately one car or a whole train.

JUDGE the Extension Side Dump Car by what it does and how it does it, but most important—by what it saves.

Subtract the cost of a few cubic feet of compressed air from the cost of unloading hopper or gondola cars with a hand shovel or grab bucket. The difference represents a direct and distinct saving resulting from the use of Extension Side Dump Cars in Cinder Service.

There are also indirect savings which are invaluable from the operating standpoint. One Extension Side Dump Car in this service releases about four gondolas for revenue earning service. The quick dumping of the load free and clear of the trucks and track permits a quick return for another load. Moreover, this method of disposal makes the cinders easily and cheaply available for maintenance of way work.

PITTSBURGH

CLARK CAR COMPANY

Oliver Building, Pittsburgh, Pa.

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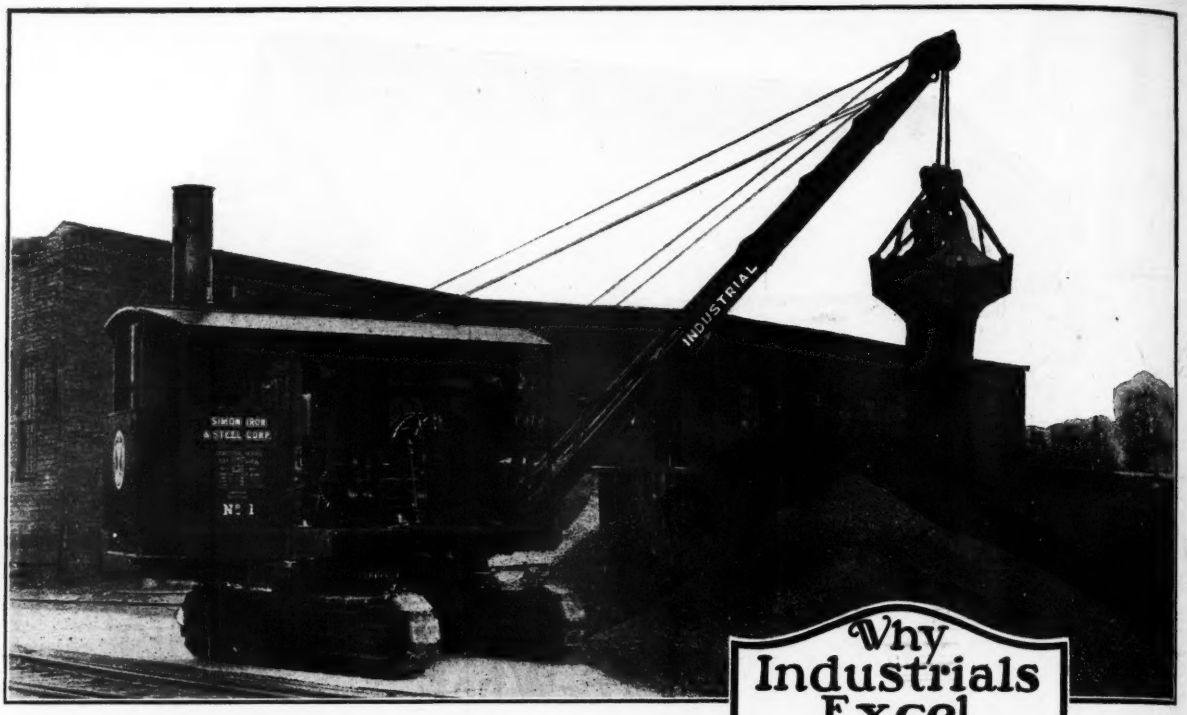


Announcing

a new INDUSTRIAL!

THE INDUSTRIAL WORKS offers to modern industry another engineering achievement—a sturdy 10-ton crawling tractor locomotive crane. Like all INDUSTRIAL cranes, this new type D excels in its class by outstanding superiority in design, construction, power, speed, endurance and general utility. The requirements of all classes of industry and the universal demand for a better-built crane of moderate capacity are now fulfilled.

The type D is built for either steam, electric, or gasoline power and is mounted on crawling tractor belts, wide gauge traction wheels or standard railway trucks of four or eight wheels. It may be used interchangeably with clamshell bucket, electro-magnet, hook and block, dipper-arm shovel, dragline, or pile driver leaders.

It is designed and executed from tread to boom tip in one plant by America's pioneer crane builders. Fifty years of highly specialized engineering experience and business integrity constitute the guarantee back of this newest INDUSTRIAL achievement.

A 16-page booklet fully describing and illustrating the type D crawling tractor crane will be sent immediately upon request.

Ask for book No. R-120.

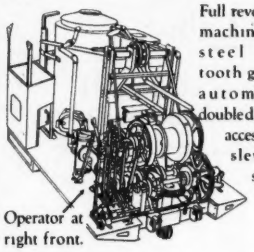
INDUSTRIAL WORKS

BAY CITY - MICHIGAN

Locomotive Cranes, 5 to 200 Tons -- Transfer, Pillar & Gantry Cranes
Railway Pile Drivers -- Combination Crane Pile Drivers -- Transfer Tables
Portable Rail Saws -- Grab Buckets -- Magnets -- Steam Pile Hammers

Why Industrials Excel

11 ULTRA-MODERN DESIGN



Full revolving machine, all steel cut tooth gears, automatic double drums, accessible slewing shaft.

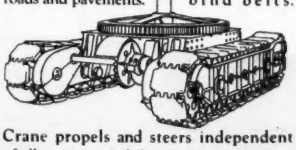
Operator at right front.

Operator can propel, slew and hoist boom at same time. Each motion has separate controlling friction clutches.

12 INDEPENDENT STEERING

Shoes of large area shaped to protect surface of roads and pavements.

Closefit shoes, no obstruction can get in to bind belts.



Crane propels and steers independent of all motions, with boom in any direction. Either belt may drive, coast or be held by brake to make a turn of any degree.

INDUSTRIAL

CRAWLING TRACTOR CRANES

Railway Engineering and Maintenance

Volume 20 July, 1924 No. 7

A CONVINCING STATEMENT

ALMOST ANY bridge and building officer who has been in charge of concrete construction for more than twenty years can recall the early days when accepted practice called for the placing of concrete so dry that it required considerable tamping to "flush the water to the surface." He will also remember the rapid transition from dry concrete to wet concrete which occurred with the introduction of reinforcing and the development of chutes for delivering concrete from the mixer to the form. The newer practice received general acceptance within a very short interval and for a period of ten to twelve years it was followed almost universally until unsatisfactory results led some students of concrete to question the wisdom of this practice. Subsequent investigations have proved that their apprehensions were well grounded and it has been shown by actual tests that the use of excessive quantities of water is attended by considerable loss in the strength of the concrete. As a result there is now a well defined tendency towards the use of less water, although the practice of making sloppy concrete persists to an unfortunate degree.

A striking object lesson in the better results obtained with dryer concrete was recently offered in a report of an inspection made by a bridge supervisor of all of the structures on a division of a railroad that was a pioneer in the use of concrete and has built a large number of concrete structures. He concluded his report by stating that, "in general, the concrete work built previous to 1904 and 1905 is in much better condition than that built later."

In consideration of the fact that this man was in nowise conversant with the controversy concerning the relative merits of wet and dry concrete and probably had forgotten that the change from dry to sloppy concrete occurred within the years he designated in his report, his statement is characterized by lack of prejudice not often to be obtained in a report of this kind and surely adds weight to the observation he offers on this much discussed subject.

THE WORK TRAIN

THIS IS the season of the year in which work trains are employed in large numbers. It is, therefore, the period in which their performance should be watched most closely. A work train is an expensive agency. At prevailing rates it is commonly charged to the maintenance of way department at $80 to $100 per day for train crew and equipment alone or at the rate of $10 or more per hour. It is also subject to the limitation of avoiding undue interference with revenue trains which commonly reduces its productive time, when working on main track, to a fraction of that for which it is paid. As a result its cost of operation, measured in units of work performed, frequently becomes very high. For this reason, careful study should be given to the possibility of developing a more economical substitute for the work train and where this is not possible measures should be taken to secure the maximum service.

Few methods of conducting maintenance of way work have been subject to greater abuse than the work trains. On many divisions it was formerly the practice to maintain one or more such trains constantly, with the result that they were frequently given tasks which could have been performed more economically by other means if the local officers had not had the train on their hands. On other divisions, supervisory officers have been free to order trains at will with the result that they have followed the course of least resistance and employed them where other methods would have been less expensive. Fortunately the wastefulness of this practice is more generally realized although alternative methods are being developed so rapidly that this subject requires constant study.

Every task in which the use

HORSES vs. RAILWAYS

During 1923 the railways of the United States handled nearly four thousand tons of freight —one mile for every person in the country. This service was ten times greater than that rendered by the railroads in any country in Europe. It was also about twice that produced in the United States twenty years ago, indicating not only the relatively greater demands made on the transportation systems of this country but also the rate at which these demands are increasing. Considering the dependence of America on transportation, and assuming that this service was rendered by horse drawn vehicles, would the public tolerate the cutting down the rations for these horses, their abuse at the slightest provocation or without provocation or the placing of poison to their water. Yet this treatment which has been and is being accorded the railways, in whose welfare the public, and more than four million adult wage earners in the railway and supply industries, have so much at stake.

of work trains is contemplated must be considered in the light of local conditions. By proper planning much work can be done by local freight trains without excessive delay or overtime. For many operations self-propelled locomotive cranes eliminate the necessity for special train service. The section motor car can be used to distribute materials more generally than is now done while the development of larger cars for this purpose is in the process of development. For those operations where the work train offers the most economical solution, the responsibility rests with the supervisory officer of so planning his work as to use the train most efficiently. This commonly leads to the joint use of a train by track and bridge forces, completing work with one train in this way which would otherwise require two. In short, the problem is one of the selection of that method which will enable the work to be performed under the conditions existing at the least cost.

THE PASSING OF A HOWE TRUSS BRIDGE

AN ARTICLE on another page marks the end of a long life. After 50 years of useful service a Howe truss bridge on a branch line of the Chicago & Alton in the state of Missouri has been removed to make place for a steel viaduct. An excess of strength, resulting from the subdividing of spans to one-half the length for which they were built originally, resulted in giving the structure surplus carrying capacity which enabled it to sustain the train loads of the present day without serious overstress. But the inroads of decay eventually required its replacement. Nevertheless, 50 years life is a remarkable demonstration of the resistance which some timbers (white pine in this case) offer to the action of the elements if properly protected. Of course, timber such as was used in this structure is not available today and, as regards the east and middle west, the Howe truss is a thing of the past. But in the Pacific northwest where excellent timbers of large sizes are available within the limits of a short haul and structural steel is to be had only at a large expenditure for transportation, the Howe truss will undoubtedly be a practical form of construction for many years to come.

INJECTING THE HUMAN ELEMENT

THE TRACK foreman is frequently depressed by the all-too-complete realization that he occupies an extremely isolated position in the railway organization. He feels that the railroad as a whole cares little about him and his problems and that, by the same token, he has little opportunity to learn what is being done elsewhere on the system. Of course, the employees' magazines have done much to improve this situation but to the man whose daily contact with the property is limited to a 6 to 10-mile section, what happens on other divisions, or in general offices or at the big terminal shops, really means little. What he does learn about the railway management comes to him in the form of circulars or letters outlining in cold, brief language what he is or is not to do. The roadmaster, during his periodic visits, is compelled, by reason of the demands on his time, to restrict his conversation almost entirely to the business at hand, to the work of the man with whom he is talking. There is little opportunity for discussing the work of the other foremen or a genuine exchange of confidences.

It was with a view to overcoming this lack of a direct human touch between the foremen and the railroad that P. J. McAndrews, roadmaster, Chicago & North Western, conceived the idea of the news letter, as described elsewhere in this issue. This in no way represents an invasion of the field of the employee magazine since it is restricted almost entirely to the business of track maintenance on the particular subdivision with which the foreman is connected, but with its contents presented in such form as to introduce that human touch which distinguishes its contents from that of the perfunctory circulars. It offers a suggestion which may well be applied more generally.

A WAY TO REDUCE JOINT MAINTENANCE

THE JOINT has long been recognized as the weak point in track construction. It makes constant demands on the time of track forces. It is also the principal factor in the deterioration of rail, leading to battering and chipping sufficient to require its renewal long before it has worn appreciably elsewhere. Up to the present time attention has been given primarily to the removal of the effect of this deterioration and relatively little effort has been directed to the removal of the causes. Thus it has long been the practice to take battered rail from the track, saw the damaged ends off and return it to service. Frequently it was relaid in branch lines where the riding qualities were less exacting, although, because of the less rapid wear on such lines many roads are now finding this outlet shut off. More recently a number of roads have found that they can restore the riding qualities of the rail and extend its life by building up the battered ends by oxyacetylene welding.

In an attempt to eliminate the necessity for these remedial measures, several roads have adopted the practice, in recent years, of applying new joints as soon as the old ones evidence diminished effectiveness. Since the joint tends to wear and to deform with the rail, the application of new joints provides increased support and retards the battering for a time. One large road has just completed a study of the time at which deterioration becomes evident in which it has found that this appears after three or four years under its own traffic conditions. It is therefore planning to apply new joints to all rail in its main tracks as it reaches this age, expecting to arrest the battering and extend the life of the rail materially.

A simpler and more effective method of attacking this problem, however, is to reduce the number of joints to be maintained. The 33-ft. rail has been standard for many years, having been established at the time when the 34-ft. car was the longest in common use. Since that time the size of equipment has increased until 40-ft. cars are in general use, yet the length of the rail has remained at 33 ft. Of late years there has been a growing demand for longer rails and a number of roads have secured limited quantities of them, principally in 39-ft. lengths. Their general use has been retarded, however, by the imposition of a premium by the manufacturers, who have claimed that this was necessary to compensate them for the added cost of handling other than the standard lengths of rail which their mills were designed to roll.

There is reason to believe that if the railways desire longer rail in quantity the manufacturers will be willing to alter their mills to furnish them at a reasonable price. They are not warranted, however, in increasing the expense unless the roads indicate, with sufficient unanimity, that they want longer rails to demonstrate that they are agreed in this desire. It is also essential that they agree on the length to which they should go. On the latter point there is now a difference of opinion, some urging 39 ft. and others 45 ft. It is important these divergent views be harmonized promptly in order that the advantages of the increase can be gained. In view of the fact

that equipment is available in all parts of the country for the transportation of 39-ft. rails and that this does not hold true for 45-ft. lengths, the former has a strong argument in its favor. Its immediate adoption would promote the means for the removal of more than 15 per cent of the joints at once.

THE GRADE CROSSING PROBLEM

STUDIES of grade crossing accidents show that a very large proportion of them are the direct result of carelessness, incompetency or temporary incapacity of the driver. This same condition is also responsible for the enormous toll of deaths and injuries that occur on the highways in which the railroads are in no way involved and it may well be said that any measures which could induce drivers of automobiles to exercise that degree of caution which would result in a virtual elimination of the colliding and ditching of autos and the killing and maiming of pedestrians throughout the highways in the length and breadth of the country would virtually solve the so-called grade crossing problem.

But when we consider how little progress is being made in eliminating the reckless and dangerous driving of motor vehicles and that the number of casualties on the highways continues to increase from year to year, it becomes apparent that it will be a long time before any relief may be expected from this source. In the meantime, the public continues to place the blame for highway crossing accidents primarily on the railroads. It requires them to bear the chief burden of preventing accidents where streets and highways cross their tracks, in a word, it expects the railroads to protect the drivers against themselves. Some measure of the immensity of this burden may be had from the fact that one railroad with less than 9,000 miles of main line is required to spend a million dollars annually in wages for grade crossing gatemen and watchmen.

This enormous sum of money and similar amounts on other railroads is being spent under the direction of the maintenance of way officers and constitutes one of their important responsibilities. The men engaged in the protection of crossings are required to exercise vigilance, judgment and tact and it is not expected that they will carry out their duties properly unless they receive ample supervision.

As noted in the report of the meeting of the Maintenance of Way Club of Chicago, which appears on another page of this issue, the work at the crossings is exceedingly difficult. Many a gateman is required to protect crossings where the railway traffic is dense and where thousands of vehicles cross the tracks every hour. It is a nerve-racking job. He is compelled to witness instance after instance of gross recklessness in which the avoiding of accidents is a matter of inches and he is constantly oppressed by the fact that he may be made the unwilling witness to a terrible accident at any moment. On the other hand, many of the drivers expect him to handle his gates with the same disregard for safety which they observe in the driving of their cars and should he lower the gates too soon or be at all slow in raising them after the passing of the train, he is at once the target of vile abuse.

It is needless to say that the men who do this work should be subject to careful and frequent supervision by a responsible officer. Moreover, they are entitled to advice, assistance and sympathetic consideration. In cases of complaints as a result of altercations between the watchmen and the driver every effort should be made to back up the employee if it can be shown that the argument arose through conscientious effort on his part to enforce the rules of safety.

Letters to the Editor

DUMP CARS FOR BALLASTING

Lincoln, Neb.

TO THE EDITOR:

The question discussed in the "What's the Answer" department of *Railway Engineering and Maintenance* for June about ballasting track with gravel is a practical one. It is my opinion that when distributing gravel ballast, the labor actually required for unloading should be practically the same whether the ballast is unloaded with center or with side dump cars, assuming that the equipment is of a type which is self-cleaning in either case. If shoveling must be done the labor involved will depend entirely on the amount of this work there is to do.

The amount of work involved in actually placing the ballast after it is unloaded also depends to some extent on how the work is being done. If the raise is being made on ballast already in the track, and new material is being used only to fill in and dress it up, or if the track has been skeletonized in advance in order to get rid of the dirty ballast, so that it is necessary to fill in between the ties before a raise is made, center unloading is more economical. By this method of unloading and the use of a ballast plow or heavy timber properly notched and armoured, the ballast can be placed practically as desired with a minimum of labor.

If, however, the raise being made is very light and the ballast is being unloaded before the raise, ballast unloaded in the center of the track is more or less in the way and may have to be shoveled out before tamping can be done properly. Under this condition it would be better to unload the ballast with side dump cars, thereby keeping it out of the track and off the tops of the ties.

An important point to be considered in this connection, however, is the saving in material. No ballast is lost by its flowing down the sides of the slope or out in the weeds and grass when it is unloaded by the center dump cars. The ballast can also be kept cleaner and more free from dirt and rubbish when unloaded from center dump cars than can be done if it is unloaded from side dump cars and has then to be gathered up off the shoulder, in which process more or less dirt is necessarily picked up. This saving of ballast is almost as important as the labor actually involved.

H. R. CLARK,
District Engineer Maintenance of Way, Chicago, Burlington & Quincy.

PICK THE FOREMAN FROM THE GANG

Abilene, Kansas.

TO THE EDITOR:

The method of placing a man with a section foreman as a student is a failure in my opinion. Out of seven student foreman which I have had during as many years, only one became a section foreman. The other six got jobs that they liked better or became displeased and quit. It a man goes to work on the section and likes his work, has good judgment, is industrious and willing to learn track work and can get along with the rest of the men in the gang, he won't need a college education to make him a good foreman.

I find that the best foremen we have are men with a limited education. I have seen well educated young men who wanted to know more about track but they were not willing to do section work or learn it. I do not remember of ever seeing a young man with a high school or college education looking for a job on the section.

The men that look for section work are laborers off the farms or around towns or section foremen's boys who do not have education enough to take up other occupations or go into some business, and who expect to work hard for what they get. These are the kind of men that make the best section foremen. The majority of my 25 section foremen were farmer boys who attended country school about three months during the year.

If comfortable houses with about three rooms were built and garden spots furnished for this class of men, at a low rental, and the men were given steady work the year around, I believe there would be no trouble in keeping good men on most sections from whom a foreman could be picked when wanted. I do not know of any inducement that could be put out to get high school graduates to handle the pick, shovel, spike maul, claw bar and track wrench, which must be done to make practical section foremen.

My objection to the student foreman is that, in paying him five cents or more per hour than the laborer, the rest of the gang (or at least some of them) get jealous of him. This is true with both white and Mexican laborers. There is no old timer who has worked on a section as a laborer but who can remember the feeling in the gang when the boss had his pet and gave him all the easy jobs. The same feeling exists today as it did then. The best men will still work their way up through the gangs if they are treated right. A. W. Ross,
Roadmaster, Atchison, Topeka & Santa Fe.

THE ESSENTIALS OF LOYALTY

Denver, Colo.

To the Editor:

Loyalty, vigilance and economy stand out pre-eminently as the foundation of any organization. The employee who permits material, no matter how small in value, to become lost or damaged, or property to be destroyed by fire, or in other ways fails to check waste when, by vigilance developed through loyalty to the organization employing him, he could have prevented the loss, is a liability to the organization.

In maintenance work there are many ways in which each of us can be disloyal. We have an obligation to fulfill. The railroad is our means of support and we should not only perform our required duties, but be on the lookout for opportunities to save wherever possible.

The employee must give himself 100 per cent to his job. A man's work cannot be done as it should be done if he attempts to work when ill, is not fully rested or when his thoughts are taken up with outside interests. Also, in doing our work we should practice the strictest economy, both in labor and in material. A foreman can reduce the cost of maintenance of his section materially by proper supervision and distribution of the men under him. The proper handling of men is very important. The successful management of work increases efficiency which can be brought about in no better way than by having the men properly distributed on the work, not allowing them to bunch up and work too close together. This bunching is not only undesirable from the standpoint of economy but when men are permitted to work close together there is greater possibility of personal injury.

In supervising work great stress should be put on the conservation of material, not permitting material to be wasted through improper use. Foremen should see that, after a certain piece of work is completed, all material is picked up and returned in usable condition to its proper place. It is often the case that, when walking over track after a number of new ties have been put in and a heavy rain has fallen, a number of old spikes will be seen lying where the rain uncovered them and possibly a tool or so which was not picked up. This reflects carelessness and inefficiency. I. M. Brittain,
Roadmaster, Union Pacific.

New Books

Popular Research Narratives. Collected by the Engineering Foundation, 29 West Thirty-Ninth street, New York. 152 pages, 1 illustration, 5 in. by 7½ in. Bound in cloth. Published by Williams & Wilkins Company, Baltimore, Md.

This volume contains 50 five-minute stories of research, invention or discovery, directly from the "men who did it," pithily told in language for laymen. It is a consolidation in one volume of brief narratives of interesting scientific developments which *Engineering Foundation* has been printing in pamphlet form at semi-monthly intervals for more than three years. These narratives are written to give the layman an appreciation of the gains made by science and a realization of the need for more knowledge of nature—for research. Among the narratives included in this volume are: The fatigue of metals; utilizing low-grade ores; electric welding; some early uses of nickel; American glass for safety; outwitting the marine borers; compressed air for under water-tunnel construction; the discovery of manganese steel; titanium products and their development; malleable iron, and wood and moisture.

Steel and Timber Structures. By G. A. Hool and W. S. Kinne, professors of structural engineering, University of Wisconsin, Madison, Wis., editors in chief. 6½ by 9 in. 695 pages, illustrated. Bound in cloth. Published by the McGraw-Hill Book Company, New York.

This volume is another one of the units which Professors Hool and Kinne are working up as a series of six text and reference books covering foundations, abutments and footings, structural members and connections, stresses in framed structures, and movable and long span steel bridges. The text of this volume has been compiled by the editors and a staff of 13 associate editors who individually and jointly have prepared the various sections of the book.

As indicated by the title, this book comprises a treatise on the design of the more simple structures in which steel and timber are used. It may be characterized as a designer's manual, combining an analytical outline of the designing method with a large fund of practical information on materials and practices presented in descriptive form. An exposition of designing methods is followed in nearly all cases by examples of typical calulations. Buildings receive the greatest amount of attention and this subject embraces 285 pages. A chapter of 73 pages covers short span steel bridges and embraces an excellent treatment of the routine of design but devotes rather limited space to illustrations of the typical framing of these structures. It would seem that more space might well have been devoted to this phase of the subject rather than to give the total of 58 pages to the design of steel chimneys. One of the most interesting parts of the book is the chapter on the fabrication of structural steel, by F. W. Dencer, chief drawing room engineer, American Bridge Company, Gary, Ind., which gives a large amount of information of inestimable value to the designer. This is followed by a chapter on erection, devoted primarily to descriptions of erection tools and equipment but devoting rather limited space to actual erecting methods. Other chapters cover wooden railway and highway bridges, steel tanks, detailing, estimating, materials, etc.

The Design Forms an Attractive Structure Well Suited to the Community It Serves

A Small Union Passenger Station for Southern Railroads

Atlantic Coast Line and Norfolk Southern Build Attractive Brick Veneer Structure at Kinston, N. C.

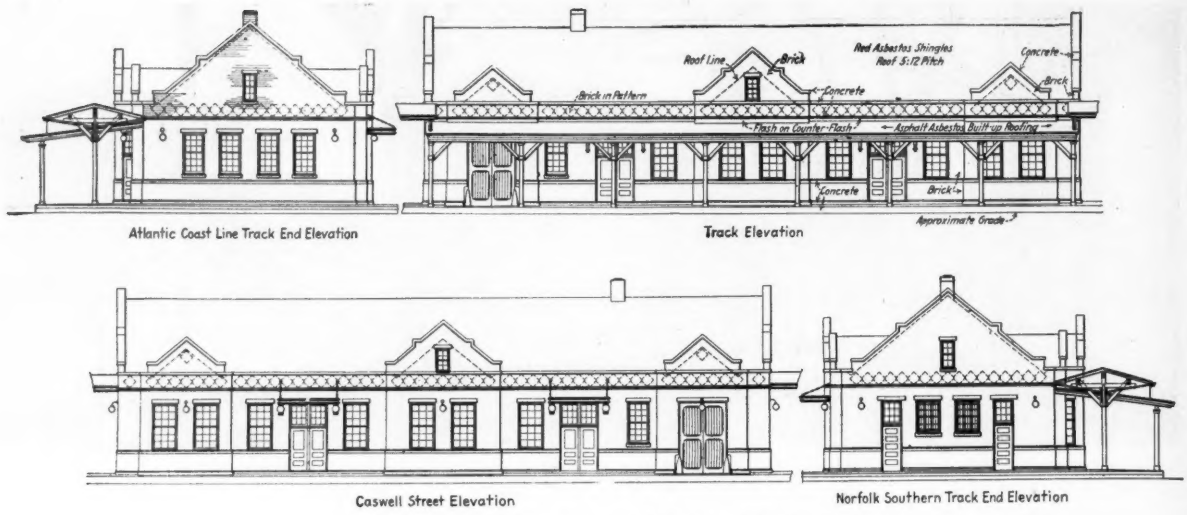
IN ORDER to fulfill a demand for combined facilities, the Norfolk Southern and the Atlantic Coast Line have recently constructed a one-story, union passenger station at Kinston, N. C. Although the design is applicable only to southern railroads, the structure is interesting both from the standpoint of attractiveness and effective utilization of space. The overall length of the station, which is rectangular in general shape, is 114 ft. and the width 45 ft. It is supported on concrete foundations with tile walls and a brick veneer, the surface of which is broken by the use of concrete belts, lintels and copings. The roof is of red asbestos shingles.

Relative Data on Size of Town

Kinston is the county seat of Lenoir county and is situated in the valley of the navigable river Neuse approximately 80 miles northeast of Wilmington, N. C., on branch lines of the Atlantic Coast Line and the Norfolk Southern. Two other railroads, namely the Kinston Carolina and the Carolina, serve the town. It is located in the midst of the North Carolina bright tobacco belt and is one of the large tobacco markets of the state. It is also a large cotton market. The population according to the U. S. census of 1920 was 12,000 including the suburbs and was 99 per cent American. The wholesale territory covers a radius of 25 miles and an estimated population of 60,000 to 75,000 people. Approximately 50 industries, including tobacco factories, cotton mills, hosiery mills, lumber construction, fertilizer, and other plants are located in Kinston, representing a total investment of about 4 million dollars; a combined output of 7¾ million dollars, and an annual payroll of 1½ million dollars. The total assessed valuation, 1921, was city, $11,200,000, county, $27,000,000, both real estate and personal property being assessed at actual value. Total value of farm products for the county (U. S. census 1919) was $10,870,000.

Architecturally the building is rectangular in shape with a rather high gable roof, the usual plainness of this type being broken up by the use of three bays on each side wall carried up to form gables. These bays are located at the center and near the ends, the center ones

Both Platforms and the Back Platform of the Station Are Protected with Shelter Sheds

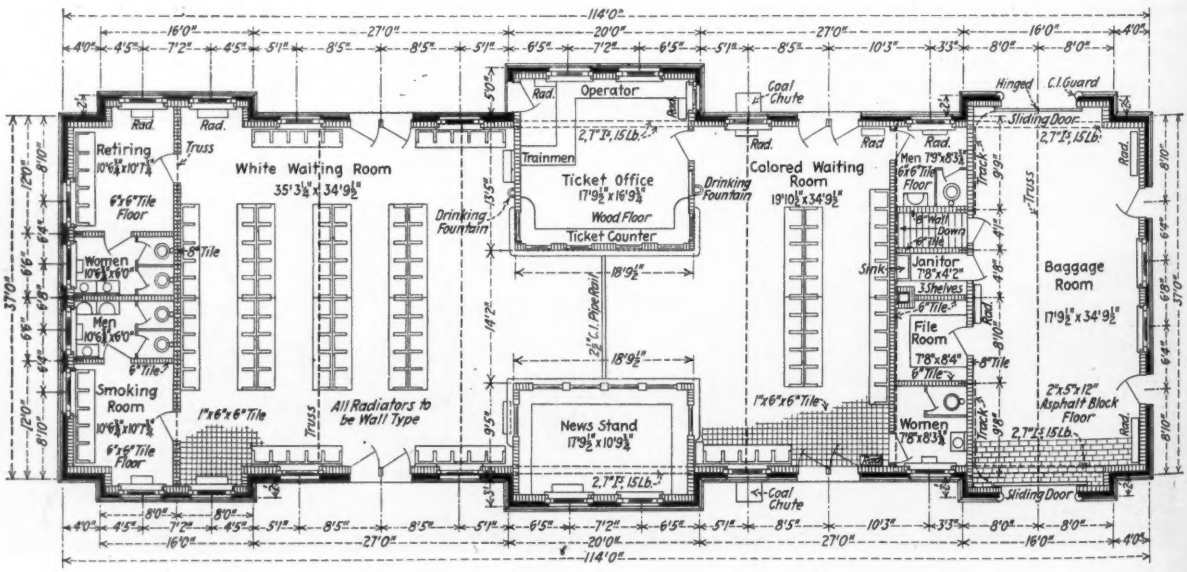


General Elevation of Each Side and End

being somewhat longer and deeper than those at the ends. The interior arrangement utilizes the two central bays as a ticket office on one side and as a news-stand on the other, thus producing an equitable distribution of the floor space as well as a harmonious division between the white and colored waiting rooms. A small railing running from the center of the ticket office enclosure to the center of the news-stand serves as the actual physical division. One full half of the building is devoted to the white patrons while the remainder is given over to the colored patrons and to the station and baggage facilities. The retiring room, the lavatories and toilets and the smoking room for each class are arranged at the opposite extremes of the waiting room area, the facilities for the whites being along one end wall and for the colored along the intermediate wall separating the baggage room from the remainder. The space along the intermediate wall also includes a file room, a janitor's room and a stairway to the basement where the heating plant is located.

Double doors are provided for entrance and exit on both sides of the station and in both waiting rooms. The ticket office and the news-stand are arranged to serve the white and colored waiting rooms independently. The former has three grills in each room and measures 18 ft. 9 1-3-in. long by 18 ft. 5-in. deep, approximately five feet of this depth being obtained by the bay. A provision for the convenience of the trainmen and the telegraph operator has been made by the incorporation of an L-shaped counter in one corner of the office. This is reached from the outside of the station by means of a door in the side of the bay, providing for the independent transaction of company business of this nature. The entrance to the ticket office proper is through the colored waiting room.

The floor of the waiting rooms, retiring and smoking rooms, toilets and lavatories is of 6-in. by 6-in. by 1-in. red tile with a tile base strip around each room. These floors are laid over a 1-in. dressing of cement grout on 3-in. concrete sub-floor of a 1:2½:5 mix except over the basement where the sub-floor is 7-in. thick, reinforced concrete of a 1:2:4 mix. The ticket office and the news-stand are laid with ⅞-in. T & G, end matched maple flooring over a concrete sub-floor which had been given

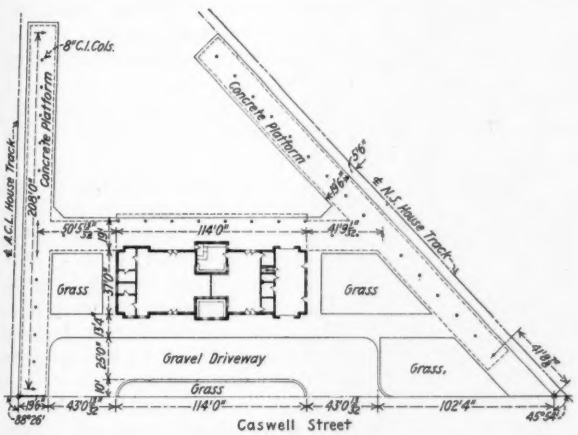


The Floor Plan of the Kinston Station

a thorough coating of liquid waterproofing. The floors in the file room and the janitor's room are of concrete with a 1-in. finish surface of cement, fine aggregate and a metallic hardener. The baggage room has a floor system consisting of 2-in. by 5-in. by 12-in. asphalt blocks on a 2-in. sand cushion supported in turn by a 4-in. concrete sub-floor.

Lighting

The interior is finished with plaster painted a light color and trimmed with timber. The ceilings are ⅜-in. sheet rock panelled throughout except in the baggage room. Artificial lighting is provided in the main sections of the station by means of 200-watt, four-in-one clusters located at various points in the waiting rooms, the space between the two, in the ticket office and in the news-stand. Individual drops are used in the smaller rooms as well as over the operator's table in the ticket office. One hundred-watt, four-in-one clusters are used in the baggage room. The various facilities are heated by radiators located along the walls and supplied with steam from a heating plant located in a basement under the colored waiting room. The seating arrangements



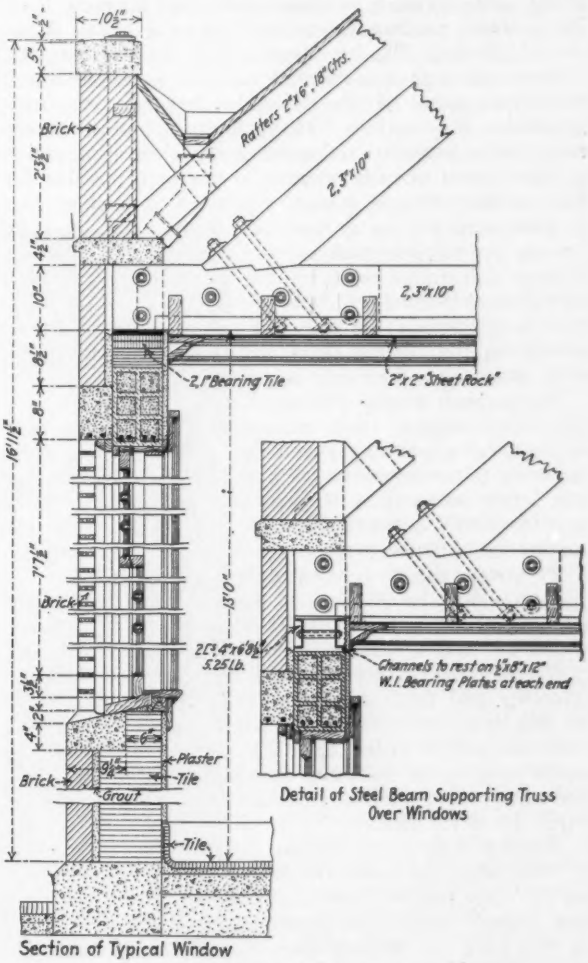
General Arrangement of Station, Platforms and Tracks

consist of single and double settees with arm rests placed in rows in the center of the waiting rooms and along the walls, the capacity for the white waiting room being 90 and the colored, 37.

Structurally the building is of tile supported on concrete foundations, utilizing 8-in. hollow tile for the outside walls and the two main intermediate cross walls. The remainder are of 6-in. hollow tile. The main concrete foundations are 17¼-in. thick supported on footings 2 ft. 9¼-in. wide and 12-in. deep. The intermediate foundations are 8-in. thick with footings 2 ft. wide by 8-in. deep. The exterior is of brick veneer, utilizing five slightly differing shades of matt-surfaced brick. A pleasing variation in the surface was obtained by carrying the foundations above the ground line, the introduction of a concrete belt about 6-in. wide at the height of the window sills, concrete lintels, a brick parapet with the bricks laid to form an ornamental frieze and concrete corbel tables and copings. This concrete work has a smooth surface secured by rubbing with carborundum brick or some other similar abrasive.

The roof is, as stated, of the gable type with three small gables on each side. It has a pitch of 5 to 12. The roof structure consists essentially of 2-in. by 6-in. rafters supported by purlins on a series of timber roof trusses. The sheathing consists of ⅞-in. tongue and grooved plank upon which rosin sized paper and then red asbestos shingles were laid.

The platforms which serve the house tracks of both railroads are of concrete, 19 ft. 6 in. wide. The one on the Atlantic Coast Line track is approximately 218 ft. long and the one on the Norfolk Southern track approximately 290 ft. Both are covered with umbrella type shelters connecting with a similar type of shelter over the crosswalk leading to the station building. These platform sheds are 17 ft. wide and are carried on 8-in. cast-iron columns and bases anchored to heavy concrete block foundations. The roof is of timber construction overlaid with four-ply, built up, asphalt-asbestos roofing.



Typical Window Details

The gutters are of Douglas fir, 5-in. by 7-in. in dimension.

The Kinston station was designed by and erected under the supervision of the engineering departments of the Atlantic Coast Line, J. E. Willoughby, chief engineer; and the Norfolk Southern, F. L. Nicholson, chief engineer, to whom we are indebted for the information contained in this article.

EARNINGS REDUCED.—Operating revenues of the Class I railroads, representing a mileage of 235,937 miles, totaled $474,821,580 in April, according to the Bureau of Railway Economics. This was a decrease of $48,486,000 or 9.3 per cent as compared with the same month of last year. During the same month operating expenses totaled $377,692,300, which is a decrease of 6.5 per cent compared with last year.

Weekly News Letter Helps Roadmaster Reach His Men

IT IS the duty of the roadmaster to maintain an intimate contact with his foremen; the circular and the butterfly are poor substitutes for personal visits. Every efficient supervisory officer subscribes to the principles embodied in this rule of conduct but with a large territory to cover he realizes that even at best his opportunities for direct contact with the foremen come at too infrequent intervals. Recognizing the limitations imposed in the exercise of supervision over his men, P. J. McAndrews, roadmaster on the Chicago & North Western at Sterling, Ill., hit upon a plan for reaching the foremen through the railroad mail by a means which overcomes many of the objections to ordinary correspondence or circulars. Through the aid of a weekly news letter prepared on mimeograph sheets, of which a copy is sent to each foreman, it has been possible for him to introduce a human touch which enables him to place emphasis on an important lesson, to disseminate certain general information or to issue instructions in a manner that drives home without causing friction. That this plan is meeting with hearty response from the foremen is attested by the fact that failure to receive these letters on the regular dates brings inquiries from the men as to when they may be expected.

The subject matter presented in these letters covers the entire range of track maintenance activities, in fact, any subject concerning which the roadmaster may have occasion to communicate with his foremen. Plans for the active prosecution of particular items of the work are frequently outlined through these letters. For example, the following taken from a letter of April 12, 1924, covers the tie renewal program:

"We should be in shape to have at least 80 per cent of our forces on tie renewals beginning next Monday, April 14, and I want every effort made to rush this work, in order to keep up with our progress program. Weather and track conditions have been such that up to this date but a very small number of ties have been renewed and to make April 20, 1924, show nearly the same progress as the same date in 1923, we must have the maximum possible renewals during the week of April 14 to 19, inclusive."

Another item is covered as follows:

"We want all sweet clover on the right-of-way cut in the early part of June while tender, and if you have not enough scythes and snaths, they should be ordered if you have not already done so. If ordered and you do not receive them in time, you should advise this office, giving the requisition date."

Instructions concerning certain equipment or appliances are often outlined in the letter, as indicated in the two paragraphs below:

"We are advised that a type of switch stand known as Pettibone-Mulliken High "Star" No. 3 stand will in some cases be furnished to take the place of our high C. & N. W. No. 1. Should you at any time receive the new type of stands, see that they are so placed that in opening the switch the lever will be moved away from main track.

"Foremen having Fairmont motor cars will be sure that the water jacket is never allowed to be more than three-quarters full in freezing weather. If they do not contain more than that much water, the jackets will not burst on account of freezing."

The following paragraph which often forms the subject of a special circular, may readily be covered in a letter of this kind with as good, if not better, results than would normally be obtained.

"A commendable improvement is being made in the prompt release of cars loaded with company material, and we have not had a complaint of delay for 15 days. This speaks well for the foremen and I hope it will be kept up."

Other subjects covered in these letters are tables of material prices, which serve as an object lesson in economy; special instructions concerning rules for the time checking of men who leave the service; the ordering of passes; or the procedure in obtaining additional men. Seasonal suggestions covering the necessity for particular attention to certain items in the responsibility of the foreman have an important place in these letters, as illustrated by the following:

"The season when we may expect severe wind and rain storms is here and we wish to have every employee of the track maintenance department fully alive to the importance of a strict compliance with the rules requiring inspections and reports. You will understand that when conditions appear to justify your having an inspection made, it is necessary to notify train dispatchers that you are going out, and then, of course, make report on your return. Study the rules on this matter, talk to your men about it and have a full understanding as to the making of inspections."

Perhaps no subject has received more frequent attention in Mr. McAndrews' letters than that of safety as illustrated by the following:

"Our attention is called to the improper use of red flags in giving proceed signals where caution flags are used during the time gangs are working on tracks. Red means "STOP" whether swung in the air, or any other way, and you will not therefore use red flags or lanterns except as a stop indication. In signaling enginemen to proceed (after taking the caution indication and slowing down for your work) either give a hand signal or use the proper flag, which is a green one.

"During this extreme heat, care should be taken to provide plenty of good drinking water for all employees, and men should be cautioned to exercise care in the use of ice water where it is used. Many heat prostrations result from the excessive use of ice water when men are overheated.

"An investigation recently made by inspectors of the Interstate Commerce Commission proves clearly that a serious derailment of a passenger train was caused by malicious persons disconnecting the rails and pulling spikes to form a derail. This is another reason why track jacks, claw bars, lining bars, spike mauls, etc., should never be left out along the track where they might be picked up for use in such crimes."

Occasional sarcasm may be justified in driving home some particular lesson as illustrated in the following:

"I am indicating below the approximate costs of your track gangs at the present rates of pay and would especially bring it to the attention of those foremen whose men are so delicate that, although they are being paid, it was necessary for the foremen to get them into a tool house while a light snow was falling yesterday forenoon. The foreman is a responsible man and we may be sure that if he were paying the wages of these men out of his own pocket he would have handled the matter differently, but because someone else is paying them he has his gang of four, six or eight men personally conducted to the toolhouse where they may look out at the beautiful snow fall with the sun almost out and have a "pleasant hour of song and story" at the expense of the stockholders."

A Man Must Always Adapt Himself to His Surroundings

"It Is Folly," Says Sir Henry Thornton, "for Him to Try to Force People to Adopt His Habits and Customs"

By Walter S. Lacher

"IT IS MY observation that you can't keep a good man down. I can't speak for the continent of Europe but I know that in England, as here in America, the man with ability and energy receives ample opportunities for advancement. When I went to England I found that the general managers of the railroads, whose positions are equivalent to that of president on American roads, were with few exceptions men who had risen from the ranks."

The concluding remark, of course, is directly contrary to the prevailing impression on the western continent, but surely there are few men better qualified to make it than Sir Henry Worth Thornton, K. B. E., who possesses the rare distinction of having served in an executive capacity on the railroads of three great countries, the United States, England and Canada. Moreover, his gradual rise from a minor engineering position on the Pennsy.vania, Lines West, in 1894, to the head of the Canadian National, a system with more miles of line than any other in the world, is, in itself, a remarkable demonstration of its fundamental truth.

It is certain that Sir Henry is endowed with an abundance of the native prerequisites so essential for the greatest measure of success in meeting the opportunities that come. This is impressed at once on anyone who has had the good fortune to meet him or to hear him speak and with it there comes the conviction that this man of enormous stature, who seems to radiate strength and energy with every gesture, would be just the one to take command of any situation whether it concerned a washout, a train accident or a conflict of powerful interests at the conference table.

Nevertheless, the manner in which he has applied the resources at his disposal in the course of a most unusual career comprises a narrative that reads like fiction and should afford renewed inspiration to any man who feels that the obstacles in his way are insurmountable. The story of this American who began his life's work as a subordinate engineer, became an English railway officer, served as a major-general in the British army and was elected to the head of the most extensive of all railway systems, is replete with illustrations of the effective application of energy, tact, resourcefulness, and above all, adaptability in coping with the multitude of exceedingly diversified problems with which he has been confronted.

Some men who have achieved marked success in life displayed more than ordinary ability in the performance of technical work in minor positions. This, apparently, was not the case with young Thornton. According to his old associates, he never manifested particular proficiency with the level or transit but even in those early days he evinced a native leadership which enabled him to call forth the best efforts of his assistants. The chances are, therefore, that any rodman or chain man in his party who displayed any aptitude soon received ample opportunities to try his hand at the "gun" while the chief, devoted his time to work which he deemed more important or kept his eyes open for every opportunity to gain the widest possible knowledge of railway transportation. It may also be presumed that it was a consistent adherence to this policy which resulted in his advancement through various engineering positions and a short period as track supervisor at Columbus, Ohio, to engineer maintenance of way on the Erie and Ashtabula division in November, 1889, and, 17 months later, or at the age of 29, to superintendent of the Marietta division.

Sir Henry Worth Thornton, K. B. E.
Chairman and President, Canadian National

Shortly after this promotion and before he had had opportunity to become acquainted with the division or its personnel an incident occurred which affords an illuminating insight into his methods of direct and forceful action. Floods in the Ohio and many of its tributaries along the division interrupted all traffic. Superintendent Thornton was at the north end of the line where the conditions were most severe and required his personal attention. The wires were down and he had no information whatever as to the conditions on the Ohio at Marietta. Being unfamiliar with the territory affected or the men located there, he called in a young fellow who

had been appointed assistant engineer but a few days before and gave him these brief instructions. "You will go to Marietta by any means of transportation available and assume authority over all employees. Do whatever is necessary to protect the company's interests and open communication as soon as possible, reporting the situation and the results accomplished." The soundness of his judgment in the selection of this young man is attested not only by the manner in which the work at Marietta was taken in hand but by the fact that this assistant engineer is now the president of an important railroad.

This incident suggested a question as to the manner or method of judging the capabilities of men. While perhaps not informative, the answer is pertinent.

"There is no direct answer," he replied. "A man who expects to be an officer must possess the ability to judge of the capability and loyalty of his assistants. That's what he is paid for. Of course, he must use every opportunity to obtain all the information he can about his men. A man is known in the community in which he lives and a few well chosen inquiries will usually develop important facts concerning him. I have also found that I can learn much about a man by taking him out to play golf, by observing how he talks and acts, by the kind of clothes he wears. Of course, we all make mistakes, even preachers go wrong and so do bank cashiers, and I must admit that I have sometimes been mistaken in my judgment of men."

"There are, of course, other important requisites for an executive."

"Yes, in addition to knowing your men you must know how to get them to work for you. This requires that your dealings with them are founded on justice and sympathy. The exercise of these qualities will sometimes enable you to obtain good results with a man who would otherwise be a failure. I can best explain this by an experience I once had with a conductor on a railroad on which it was the practice to issue annual passes for meritorious service. This conductor had a poor record. He got into trouble repeatedly. But after a study of his case I came to the conclusion that although there was evidence of considerable carelessness, it was clear that he had been the victim of misfortune. So one day I called him into the office and said, 'I guess you are about the poorest conductor we have,' and he meekly replied 'Yes, I guess I am.' To this answer I said, 'Well, I am going to give you a meritorious service pass, not because you deserve it but because I think you can live up to it.' His subsequent record shows that my judgment was correct and that this manifestation of sympathy was just what he needed to make him exercise the necessary vigilance and interest in his work.

"There is another case of a somewhat different nature. During the time that I was superintendent on the Pennsylvania, a new system of watch inspection was introduced and I found that the old watch inspector on my division was having great difficulty in adjusting himself to the changed methods and there was a decided difference of opinion among the members of my staff as to his ability to carry on the work under the new rules. None of us knew anything about watch examination ourselves and we had about concluded that we needed a new examiner when my attention was called to the fact that the father-in-law of one of my assistants was a watch examiner on another division of the Pennsylvania. So we got him to come on the pretext of a visit to his son-in-law and introduced him to the local watch examiner. The visitor, in the course of his friendly visit with the local man, found that he was loyal, but in a rather confused state of mind and was primarily in need of a system of records which he did not know how to devise. But after this had been formulated for him he understood it thoroughly and was thereafter enabled to conduct his work to entire satisfaction.

"However, when I say that an officer should observe a kindly and considerate attitude toward his subordinates he must be exceedingly careful not to allow himself to be misunderstood. Under no circumstances should he brook any nonsense. He should never do anything that will cause his attitude to be mistaken for weakness or fear."

"But there is another problem of the executive," I suggested, "that applies not to his own relations with his subordinates but to their relation with each other. I refer to the situation which arises when there is a clash of personalities."

"Such situations do arise, of course. My own policy is to say to the men involved, 'Now see here, you two fellows have got to get along together or either one or both of you must get out.' That usually settles it, but occasionally the way out of the difficulty is to separate them. We now recognize divorce as sometimes necessary in marital relations and occasionally it is required in the railway organization."

A re-view of Sir Henry's career naturally gives rise to curiosity as to the circumstances which led to the selection of an American railway officer as the chief executive of an important English railway. Early in 1914 the directors of the Great Eastern of England, after a thorough review of the affairs of that property, came to the conclusion that it was necessary to make a change in the position of general manager and after a thorough canvass of the situation decided to make what seemed to everyone a most unusual and unprecedented solution of their problem—to look for a man in America. This task fell upon Lord Claud Hamilton, chairman of the Board of Directors, and when he came to New York it was natural that he should begin his search among the railway men whose offices were in the American metropolis. So it is not surprising that he soon met Henry Thornton, who had been for four years the general superintendent of the Long Island Railroad.

One may readily appreciate the surprise with which General Superintendent Thornton received Lord Claud's remarkable offer. It is also easy to understand that its acceptance was attended with grave misgivings. It involved an enormous increase in responsibility in a field that was entirely new and where physical conditions, established methods, forms of organizations, in fact, almost everything that had to do with the position, differed widely from the conditions under which he had been employed.

It will be recalled that 1914 is a most important year in the world's history and Sir Henry had scarcely had an opportunity to become acquainted with his new problems when England was thrust into the great war so that the Great Eastern, with its network of lines along the east coast, became the principal artery for the movement of troops and war materials.

That the new general manager was able to meet this crisis is attested by the recognition soon accorded him in his appointment to the executive committee of general managers which took over the control and operation of the British railroads under the direction of the government. Those were times of action when broken precedents were the order of the day and men who could get things done were not wanting for opportunity. New commissions with ever increasing authority and responsibility were thrust on him in rapid succession. In 1916 he was asked to become deputy director of all England's water transportation in Northern France,

Egypt and Mesopotamia with the rank of colonel in the Royal Engineers. Early in 1917 he was sent to France as assistant director general of movements of the railroads, in which capacity he represented the director and army council in all negotiations relating to transportation with the French, Italian and United States governments. In December of that year he was made deputy director general with the rank of brigadier general and in 1918 he was appointed director general of transportation with the rank of major general. Finally, in 1919 he was made a knight commander of the Order of the British Empire.

To meet new conditions, to become almost at once a dominating figure in an entirely new sphere, calls for a variety of sterling qualities. But of all these none could have been more essential than that of adaptability. Clearly, no one could be better qualified to answer a question as to the requisites for that quality.

"Fundamentally," he replied, "the peoples of different countries who enjoy the advantages of democratic government are much the same. However, during periods extending over many centuries they have each built up distinctive customs, habits and an individual psychology which constitute a fixed part of their makeup and with respect to which they differ from the peoples of other countries. Therefore, any man who is thrown into a new environment wherein he finds that the habits and customs differ essentially from those to which he was accustomed must adapt himself to his new surroundings and adopt the customs of those with whom he must deal. It would be folly for him to make any serious effort to force the people to his way of thinking or his own habits and customs for his efforts will not only be futile but they will cause him no end of trouble.

"When the responsibilities of his position require him to make modifications of established practices it must be done by tactfully steering things in the desired direction, by moulding or massaging the established way of things so as to meet his ends. For example, here in America we move trains by what is known as train dispatching. In England they have what is known as train control and although I was convinced of the definite advantage of train dispatching, I carefully avoided any effort toward its introduction in England. Instead, I adapted certain principles of train dispatching to the system of train control which prevailed there.

"The fact that people of a country have developed certain customs or habits that have prevailed for many years without appreciable modification constitutes rather definite proof that the experience of centuries has shown that those things are the best under the particular circumstances. So if we find that people do certain things, drink certain things, wear a certain type of clothes or prefer certain games or other forms of recreation, it is best to go along with the current and adopt their customs. If you happen to be in China don't try to get porterhouse steak or kidney pudding but order chop suey."

"Can you suggest any other qualities or line of action on your part that was of assistance to you in overcoming the prejudice created through your appointment?" I asked.

"I can recall one," he replied. "When I prepared to go to England I determined not to take with me a single American railway employee or officer. I also refrained for some time from making any important changes in the personnel or the organization of the Great Eastern as I found it. This I am sure was of great help to me in obtaining the good will and sympathy of the staff. But entirely aside from the advantage of this policy with respect to the particular case, I am thoroughly convinced that it is a mistake for a man to make drastic changes in existing organizations. You know it has long been the custom of railway officers in America, when they have been called from one property to another, to take with them certain assistants or department heads in whom they have learned to place implicit trust, but I have never favored that practice. A man should exhaust the mental capacity of the organization before he brings in anyone from the outside. Of course, if he finds that he must have a new operating vice-president, or a chief engineer, for example, and there is no one whom he can promote, it is necessary for him to look elsewhere. But to import a great many men is sure to prove discouraging to the organization."

"The justification, as I have understood it, for the practice of taking the nucleus of an organization to the new property is that the officer has felt that he must have assistants whose capacity and integrity he has thoroughly tested."

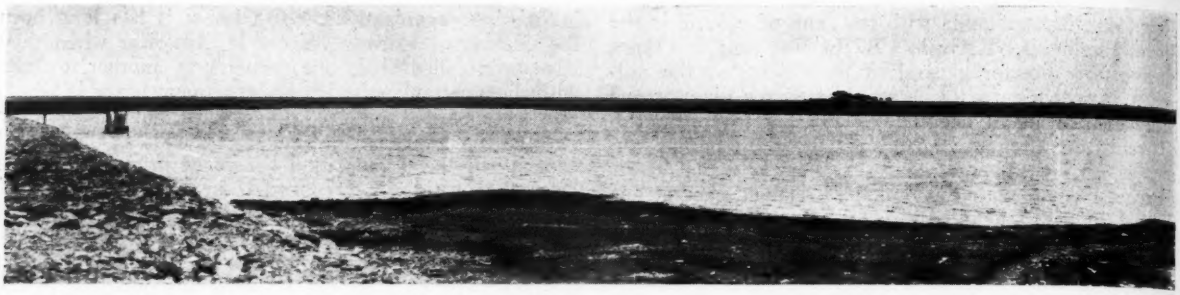
"That may be true," he conceded, "but as I said before the foremost requisite of a railway officer is an ability to judge accurately of the capability and loyalty of his subordinates. I am constantly impressing my assistants with the fact that it is their chief duty to develop the enormous volume of latent brain force which is to be found among the thousand of railway employees. This may be compared to the energy of a waterfall in that it will be wasted unless definite measures are taken to utilize it. The problem is unusually difficult on the railroads because employees are scattered over an enormous area and must work so largely without direct supervision. In a great measure, the management is at the mercy of the men. The section foreman must do most of his work without supervision from his superior, the train crews are away by themselves and except for the fact that the dispatcher knows where they are, the railroad must depend upon their initiative and interest to conduct their work effectively. My theory is that at least 75 per cent of the effectiveness of a railroad depends upon this human factor. But responsibility for its development falls not alone on the general officers; it is the duty of every officer, every roadmaster and every foreman to bring out the best efforts of their subordinates."

Broken Rail Causes Fatal Accident

ON April 2, 1924, the derailment of a passenger train on the Richmond, Fredericksburg & Potomac near Woodford, Va., resulted in the death of the engineman and injury to four other persons. The investigation of this accident by the Bureau of Safety of the Interstate Commerce Commission indicated that the derailment was caused by a broken rail, no other circumstances apparently contributing to the accident. The rail involved was an A. S. C. E. section weighing 100 lbs. per yd., rolled in May, 1909, and is assumed to be of Bessemer steel from the middle part of the ingot.

The fracture was in the web at the receiving end of the rail. Commencing immediately under the head, it extended through the second bolt hole and thence in an irregular line for a distance of 27 in., where it turned upward abruptly in a square break through the head.

It is believed that the break in the web started at the end of the rail and continued progressively for some time previous to the accident but that the square break through the head occurred at the time the accident took place. According to W. G. Borland, director of the Bureau of Safety, this accident points to the necessity for the most careful scrutiny in the track inspection of rails for the detection of incipient lines of ruptures of those types which admit of discovery before complete failure is reached.



A Portion of the 350,000,000 Gallon Reservoir Near Cassoday.

Santa Fe Builds New Water Stations Where Supply Is Limited

Heavy Machinery and Long Pipe Lines Required in Working Out Problems on Eldorado Line

By E. H. Olson

Assistant Engineer, Atchison, Topeka & Santa Fe, Chicago.

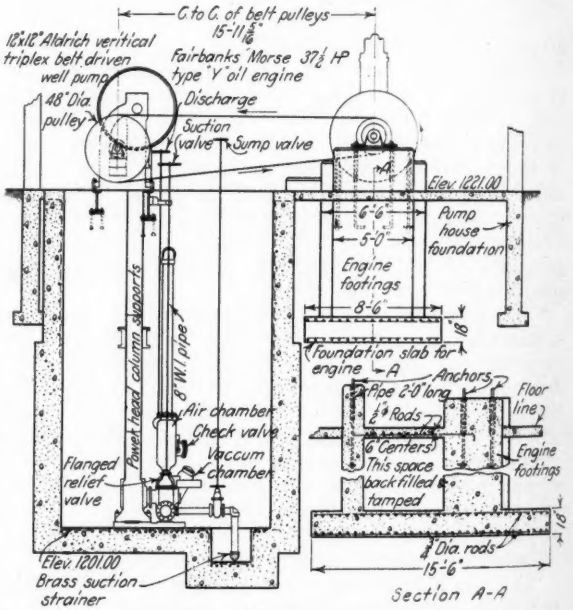
WHEN THE Atchison, Topeka & Santa Fe undertook to build a low grade cutoff line from Ellinor, Kan., to Eldorado, a distance of 49 miles, for the purpose of securing greater economy and expedition in handling its freight traffic between Kansas City, the Pacific coast and the Gulf of Mexico, and for the additional purpose of relieving its main line between Emporia, Kan., and Florence, which is the neck of the bottle of the eastern lines of the system, there arose the usual problem of providing an adequate water supply. This requirement has been fulfilled by two water stations, one at Bazar, 24 miles distant from the nearest water station on the main line, and the second at Aikman, 23 miles south of Bazar. These facilities have pumping capacities of 550 gal. per min. They are also considered noteworthy as showing what was done to get a satisfactory supply in a region where water is not plentiful. Some of the measures adopted, moreover, are believed to be unusual, among which is a mile of suction line which is partly a siphon.

Locate Stations to Meet Train Service Requirements

Contrary to the practice of the early days of railroad construction in the west of placing water tanks at the source of supply it was decided to build the tanks at the locations most convenient for trains. A governing factor in determining the proper distance between the service tanks was the size of the tenders of the engines assigned to this territory which are of 12,000-gal. capacity. It was concluded that two water stations, each capable of pumping 550 gal. per min., and provided with 300,000 gal. storage facilities, would make it possible to supply in one pumping shift all the water that would be required by the maximum train density over the new line which now consists of one main track. The figure of 12,000,000 gross tons yearly, used in determining the justification of the new line, was the factor in arriving at the estimate of water needed.

Bazar Water from Shallow Stream

The only logical source of the water supply for Bazar was the east fork of the Cottonwood river. This river is reasonably close at hand, but, like many streams in the west, is subject to a wide variation in the amount of water carried, this stream occasionally running so high as to overflow its banks and flood the valley, but at other times running practically dry except for scattered water holes. To dam up this stream was prohibitive owing to considerations of cost for construction, land required, and for damages to property affected. A study of the ground formation showed that it was equally out of the question



A Drawing of the Pump House at Bazar Showing the Construction of the Engine Footings.

to develop a deep well supply in the vicinity. Directly below the bed of the stream and underlying the valley, however, is a stratum of lime gravel which has a maximum depth of only 6 ft. but holds some water the year around. It was decided, therefore, to develop the supply by pumping from this gravel stratum close to the river bed.

An intake was constructed by building a well 30 ft. in diameter and 25 ft. deep on the north bank of the

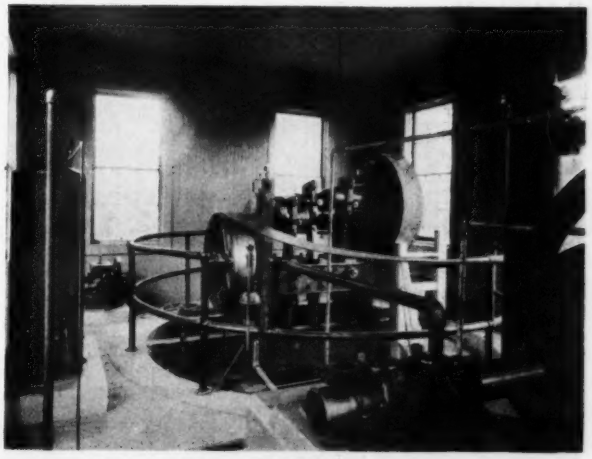
channel at this point. For a distance of 11 ft. down from the top this well has 12-in. reinforced concrete walls. Below this for a distance of 6 ft., where the gravel stratum is penetrated, the wall consists of a double layer of brick with open joints to allow infiltration of the water. The remaining 8 ft. of the wall is blasted out of the rock and provides a storage basin below the brick ring large enough for 16 hours' supply of water. The roof of this well is even with the ground and is built of reinforced concrete slabs 3 in. thick, with 16½-in. T beams. This construction allows high water and drift to pass over the well without damage. The space between the brick and the shoring, required during construction, was filled with gravel. Access to the well is obtained through a two-foot manhole in the roof, situated above an iron ladder fastened to the wall on the inside.

This is the type of intake provided for the present. Should it become necessary to increase the supply, it is proposed to build a submerged dam across the channel and adjacent lowlands a short distance downstream from the well. This dam will be 400 ft. long and will have an open tile line laid along its face on the upstream side to catch the intercepted underflow and facilitate its entry into the intake well.

Triplex Pump for Variable Suction Head

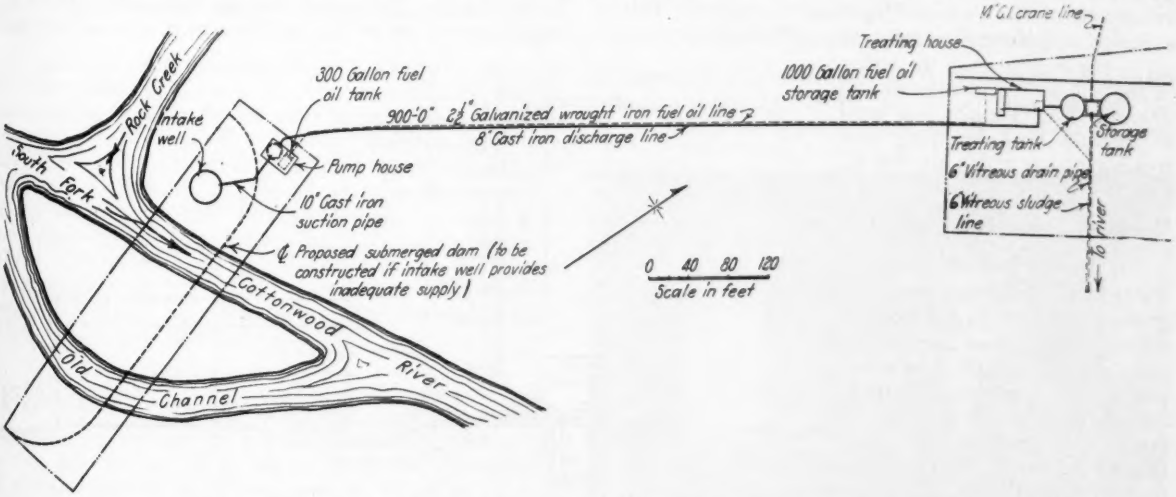
The maximum total pumping head at Bazar is 175 ft., which may vary 35 ft. with the stage of water in the well. This variation and the large quantity of water to be pumped were important factors in designing the pumping units and determining the location of the pumphouse. The location selected was a little north from the intake well where higher land was found and some protection was afforded from the high water and drift. At this point a 20-ft. by 31-ft. frame pumphouse was built on a concrete foundation which extends about five feet above the adjoining ground surface, thus bringing the floor above extreme high water. In one end of this pumphouse is a circular pump pit of concrete, 13 ft. in diameter and 20 ft. deep, waterproofed with Ironite and containing a 12-in. by 12-in. Aldrich vertical triplex plunger pump. The triplex type of pump was selected because of the wide variation in the suction head resulting from the fluctuation in the level stream and also because of the large variation in the discharge head resulting from fluctuations in the load thrown on the machinery in the treating plant, which derives its power from the water in the discharge line.

The pump is operated at 33 r.p.m. by means of a single-reduction, belt-driven power head supported on I-beams spanning across the top of the pit and connected



A View of the Triplex Pump Head at Bazar.

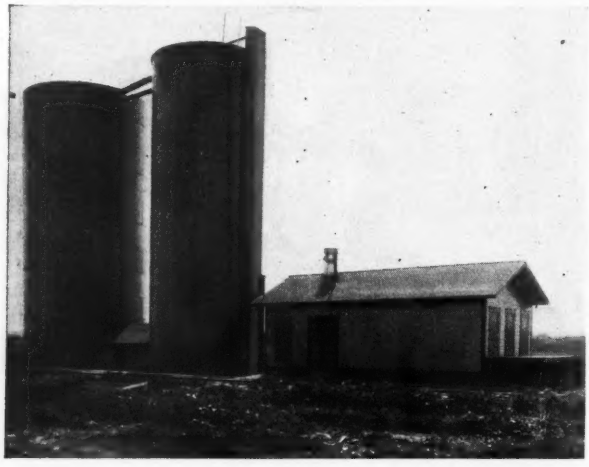
with the pump by a vertical cast iron frame. On the suction side is a vacuum chamber and a combination vacuum and pressure gage, while on the discharge side is a compression air chamber, a release valve and a compression gage. All valves in the pit have extension stems so that they can be operated from the pump house floor, but the pump itself is easily reached by a flight of stairs extending to the bottom. A sump two feet deep is provided in the bottom of the pit to collect drip water. This sump as well as the pit itself can be emptied by means of a 5-in. secondary suction on the pump should it become filled because of extraordinary high water. This sump is also reached by a hand pump situated on the pump house floor, which is installed chiefly, however, to provide cooling water for the engine when the discharge line from the triplex pump is empty.



The Arrangement of Pump House and Treating Plant at Bazar Showing the Proposed Submerged Dam.

The power is furnished by a Fairbanks-Morse 37½-hp. vertical type-Y oil engine, placed on a reinforced concrete spread footing carried down to solid ground several feet below the pumphouse floor. Fuel oil for the

engine is stored in a 300-gal. fuel oil tank in a concrete pit below the pumphouse to which the fuel oil is carried by a 2½-in. gravity line extending from a 10,000-gal. fuel oil tank located at Bazar. Since the oil engine is too large to start by hand, it is supplemented by air-starting equipment consisting of a three horse-power Fairbanks-Morse type Z gasoline engine and a 3¾-in. by 4-in. air compressor with two compressed air tanks.



The 60-Ft. Water Treating and Service Tanks at Bazar.

Water is obtained from the intake well through a 10-in. cast iron suction line equipped with a foot valve. This water is discharged through an Aldrich balanced check valve installed near the pump into an 8-in. cast iron discharge pipe which extends 900 ft. to the treating tank.

An unusual departure made when installing the engine was to equip it with a thermostatic control, a development of the Powers Regulator Company. This is a device which automatically shuts off the fuel oil supply to the engine when the water in the engine jacket reaches 180 deg. F. This permits one man to operate both pumping and treating plants which are 900 ft. apart.

Treating Tank Is 63 ft. High

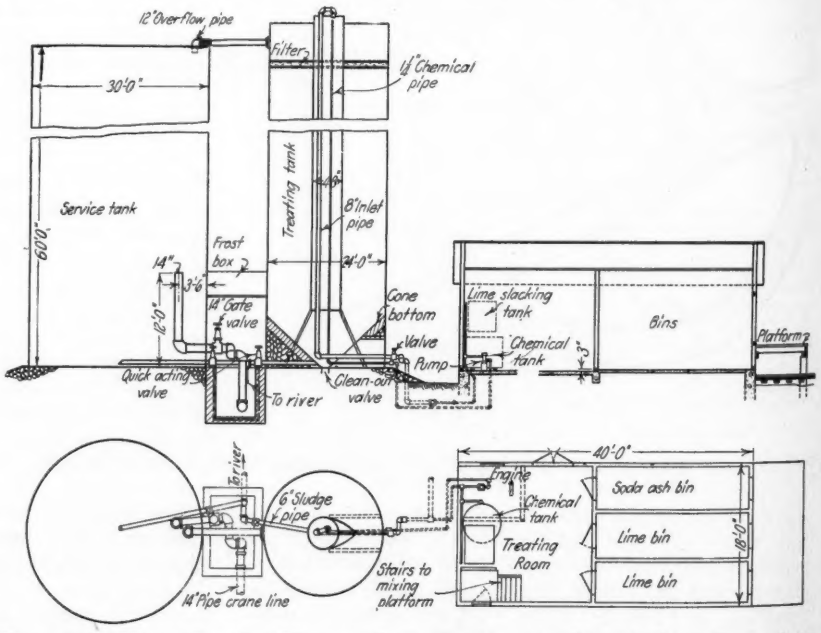
The Bazar water is not considered bad, containing only 17½ grains of matter in solution, of which 14.8 grains are incrustants, but from experience obtained with as many as 135 treating plants which this company operates, it was decided to treat this water. The facilities for this purpose consist of the Santa Fe's 18-ft. by 40-ft. frame treating house and a steel treating tank 24 ft. in diameter and 63 ft. high. The treating house is built with concrete foundation and concrete floor. It incloses three moisture-proof compartments for the storage of quick lime (which is used on the Santa Fe instead of hydrated lime) and soda ash. This building also contains the treating machinery, which consists of a lime slaking tank, a chemical mixing tank and a chemical pump, all operated by a Roberts 10-in. by 12-in. water engine. The process of treatment consists of placing the prescribed amount of quicklime in the lime tank, where it is slaked by agitators operated by the Roberts engine, which in turn derives its power by passing through it a part of the water in the discharge line from the pumphouse. When slaked the water runs into the chemical tank where it is mixed with the soda ash and from which it is pumped in the proper proportion to the top of the treating tank where it mixes with the incoming water from the pumphouse. In the center of the treating tank is a 48-in. reaction chamber which extends from the top of the tank nearly to the bottom, through which the water passes and then rises in the 24-ft. steel settling tank.

The settled water overflows through a 12-in. pipe into a 30-ft. by 60-ft. steel service tank from which it is carried through a 14-in. cast iron pipe to a 10-in. Poage water column. The two tanks are 14½ ft. apart and are connected by a concrete frost box in which are swinging joints connecting the pipe lines serving the tanks, the purpose being to allow for any settlement or movement in the tanks.

The removal of the precipitate in the treating thank is facilitated by a conical invert in the bottom of the settling tank. The sludge from this tank is removed by a six inch line equipped with a quick opening valve. This discharges into a tile line which extends to the stream, a considerable distance below the pumphouse. The tile line is built of 6-in. vitrified pipe except at the discharge end where three lengths of cast iron pipe are used. This cast iron pipe is embedded in concrete blocks which prevent the line from becoming dislodged by high water.

350,000,000 Gal. Reservoir at Cassoday

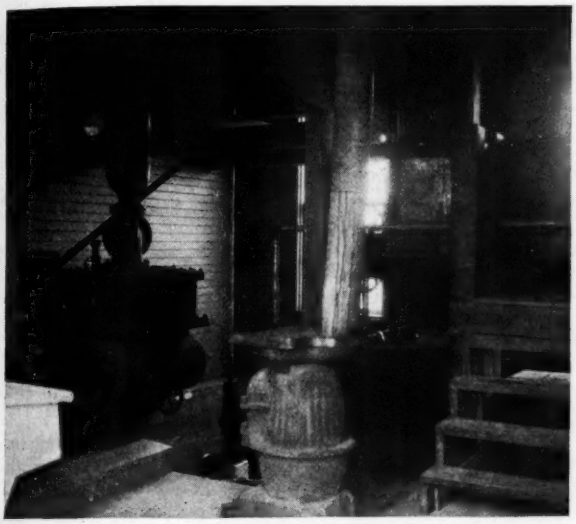
There are no streams in the vicinity of Aikman from which to secure a dependable supply. Furthermore, the ground formation is such that no suitable well supply can be developed. This conclusion has been borne out by the experience of oil drillers in this region who have drilled



Plan of the Water Treating Plant at Bazar Showing the Flexible Pipe Connections.

to an average depth of 2,760 ft. without finding more than small quantities of brackish water. It thus became necessary to find a suitable reservoir site for the devel-

opment of a surface supply. It was out of the question to find such a site close at hand since Aikman is on a divide between two water sheds at the highest point on the line. The nearest suitable location is on the east branch of the Walnut river, five miles from Aikman in a northerly direction, where a reservoir was built providing ample storage and giving a depth of 20 ft. of water. The water shed has an area of 7½ sq. miles which may be increased to 10 sq. miles by ditching and diking should occasion demand. The drainage area of this water shed is rather flat but is underlaid with a rock formation close to the surface and is nearly all in grass. This is expected to produce a large surface runoff. The reservoir is one mile long and has a capacity of about 350,000,000



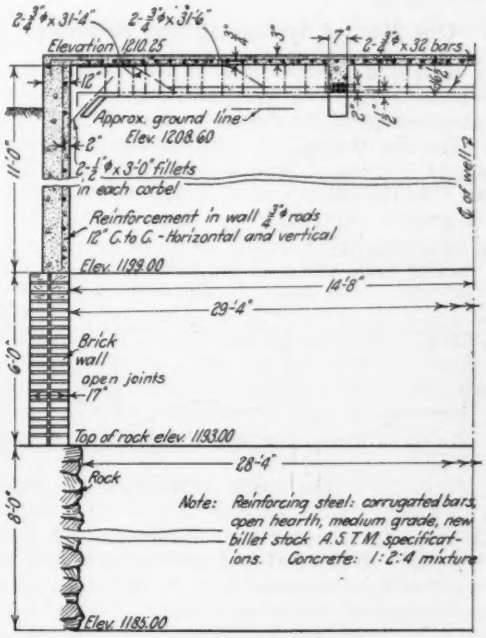
The Mixing Corner of the Treating Plant

gal., which is considered ample for the requirements for two successive dry years, allowing a maximum annual evaporation of about 60 in. In making studies to determine the probable runoff, records of the weather bureau at Wichita, Kan., extending back 34 years, were examined as this station is only about 35 miles distant and is in the same storm path as the reservoir. A study was also made of existing records at Bazar and Eldorado. These records disclosed a wide variation in the annual precipitation, the wettest year producing 44.94 in., the dryest year 16.10 in., while the average precipitation for the 34 years was 30.40 in.

Build 2,600-ft. Dam

The dam is of earth, 2,600 ft. long and about 28 ft. high with a 16-ft. crown, a three to one slope on the upstream side and a two to one on the down stream side. It contains 66,500 cu. yd. of material, all of which was secured within the reservoir site, thereby increasing the storage capacity of the reservoir about 14,000,000 gal. This material was hauled in wagons and deposited in layers about one foot thick which were packed by a horse-drawn concrete roller weighing 1,000 lb. per lin. ft.

Near the center of the dam is a 12-in. plain concrete core wall keyed into the underlying rock and extending one foot above the spillway. During construction a 50-ft. opening was left across the stream to take care of any flood waters until the spillway was nearing completion, when this gap was closed. The spillway consists of a cut through solid rock and shale at one end of the dam and is 230 ft. long, the excavation providing rip rap for the face of the dam. The water is taken from a concrete well 6 ft. in diameter inside and 28 ft. high, located within the reservoir, and is provided with 10-in. inlets, each protected by a strainer and controlled by a valve, with stem extension to the top. A 36-in. concrete sluice-

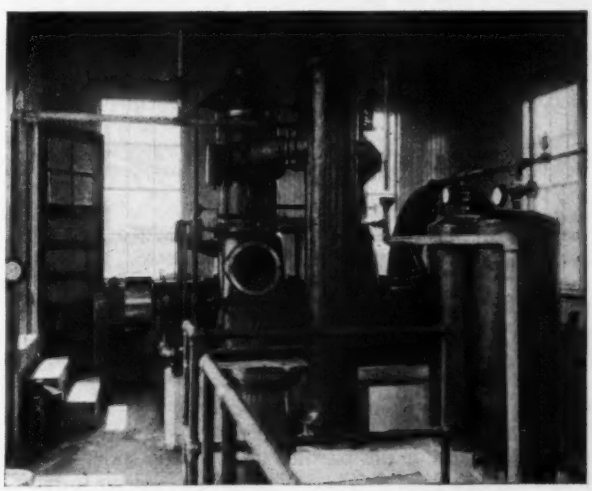


Section of the Well at Bazar

way is built through the base of the well and the dam for washing away any mud which may collect at the foot of the well.

A 100-hp. Engine for Pumping

The equipment to deliver this water to the tank at Aikman at the rate of 550 gal. per min. is installed in a 19-ft. by 30-ft. frame pump house nearly a mile away and



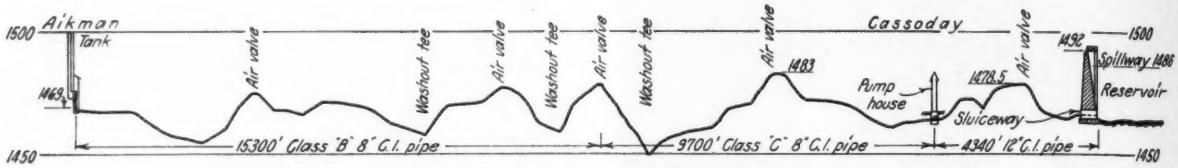
The 100 H.P. Oil Engine of the Aikman Unit.

consists of a Gould three-stage centrifugal pump located at the bottom of a 10-ft. by 11 ft. rectangular pit and driven by a 100-hp. Fairbanks-Morse vertical type-Y oil engine. The engine is securely anchored to footings carried down to solid rock and has starting equipment simi-

lar to that installed at Bazar, with a 26-in. idler in the pit to prevent slipping of the drive belt, which is 14 in. wide. When designing this plant the possibility of electrical power becoming available in this region was kept in view with the result that the plant is readily adaptable to such a change.

One Mile of Syphon Suction Required

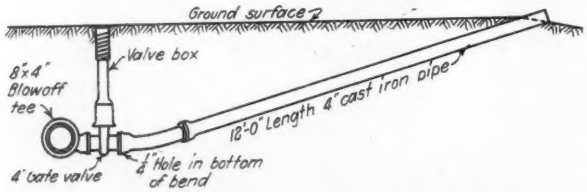
The suction line extending from the intake well to the pump house consists of 4,350 ft. of 12-in. Class-A cast iron pipe, except under the dam where Class-D pipe is used. This line was all laid with the lead joints and has the unusual feature of being a combined gravity line and syphon. As the outlet end is three feet lower than the inlet a gravity line could have been provided but this would have required a trench about 14 ft. deep through solid rock at once place or the construction of a much longer line. It was therefore decided to lay the pipe over the rock. It is 1,800 ft. from the intake well to the high point of this hump and 2,550 ft. to the pump, while the total length of the hump is about 1,000 ft. with the highest point about six feet below the elevation of the spillway in the dam. Whenever the level of the water in the reservoir drops more than six feet this line will operate on a syphon.



The Profile of the Five-Mile Pipe Line to Aikman Showing the Syphon Intake.

Both this line and the discharge line, the latter five miles long, have air release valves at the high points and the discharge line also has blowoffs at the low points. These blowoffs are formed by inserting a Clow blowoff tee in the line and extending a cast iron pipe to the surface of the ground with a valve in the system having the handle accessible from the ground surface and with a ¼-in. hole at the lower end of the line to permit back drainage. The air release valves are the regular Clow equipment designed for this purpose. These are enclosed in small timber frost boxes.

The storage facilities at Aikman are similar to those at Bazar, consisting of a steel tank 30 ft. in diameter and



The Wash Out Connection as Provided at the Low Points in the Pipe Line.

60 ft. high from which the water is conducted through a 14-in. cast iron pipe to a water column situated between the main line and the passing track. This pipe is also laid with lead joints. There was no occasion to install a treating plant at this point since the water is of good quality for locomotive use.

At this place and also at Bazar, the tanks are protected from rusting and corrosion on the inside by two coats of cement wash consisting of a workable mixture of one part of cement and two of sand applied with a brush. Experiments carried out on the Santa Fe for a number of years indicate that this is a superior method for protecting the interior of steel water tanks.

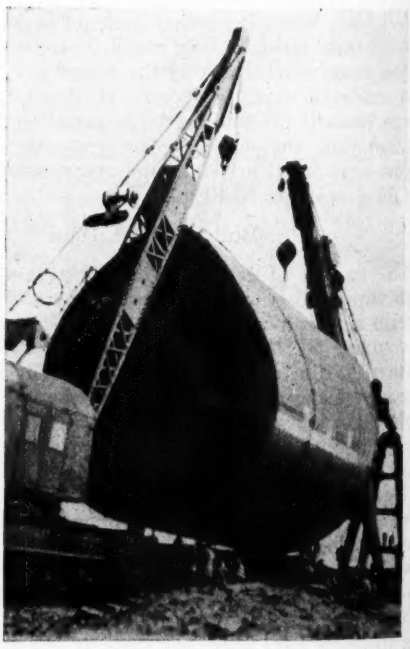
One Man Operates Both Plants

With the large pumping capacity provided at each station and the unusually large service tanks (each tank holding an available supply of 225,000 gal. above the water colums), it is possible to operate these stations with a minimum amount of attention. At the present time, with about 10 trains a day, one man operates both stations, but with an increase in the number of trains it is expected to have one man at each place.

For the convenience of the attendants, pressure gages are installed in both pump houses which indicate the height of water in the respective service tanks. In addition, altitude gages with electric contacts have been installed in the frost boxes at the base of each service tank which close an electric battery circuit when the tanks are full. At Bazar this causes alarm bells to ring in both the pump house and treating plant, while at Cassoday, because of the distance, the circuit operates a 100-ohm signal relay in the pump house which closes a local circuit that operates the alarm bell.

The construction of these two stations was begun in April, 1923, and completed in April, 1924. The work was carried out as an integral part of the entire construction project under the direction of C. F. W. Felt, chief engineer, system, with J. W. Stewart, assistant engineer, in charge of field work and S. E. Ross, assistant engineer, Chicago, in charge of office work. Bates and Rogers, Chicago, were the general contractors.

Moving a Large Oil Tank on the Santa Fe on Account of Change of Line in Arizona



Superintendents Discuss Work Trains

Report Presented at Operating Officers' Convention in Buffalo, N. Y., Contains Many Practical Suggestions

ONE OF THE most interesting features of the annual convention of the American Association of Railroad Superintendents, which was held at the Hotel Statler, Buffalo, N. Y., on June 18 to 20, was a report of the Committee on the Economical Operation of Work Trains. This was presented in the form of written discussions by five members of the committee covering various phases of the problem of handling work trains, together with a summary outlining certain principles of good practice in work train operation submitted by the committee as a whole. Abstracts of the individual discussions and the committee's recommendations in full are presented below. In addition to the railway officers whose names appear at the head of the several discussions, the committee included: W. W. Waits, superintendent, Southern Railway, Atlanta, Ga. (chairman); W. H. Newell, general superintendent, Atlantic Coast Line, Rocky Mount, N. C., A. D. Caulfield, superintendent, Illinois Central, Water Valley, Miss., and J. E. Agee, trainmaster, Atchison, Topeka & Santa Fe.

The Work Train Should Be Provided With a Regular Working Force

By L. W. Berry

Superintendent, New York & Long Branch, Long Branch, N. J.

The day's work should be laid out so as to keep the train in one location as far as possible and with due regard to train movements and destiny of traffic. Sufficient work should be planned to keep the train busy an entire day, figuring on no delays. The work train foreman should have a general understanding of all contemplated work for the reason that he may often be able to do some of the work proposed for a later date when prevented from doing work planned for that day.

A work train should have its own regular force of men as they thus become experienced in the work done such as loading and unloading rails, ties, etc. Men not accustomed to this kind of work are timid in its performance and consequently do not work as fast or as well. The force should be of sufficient size to perform all ordinary work that the train is called upon to do with one movement of the train. When doing work in which more men are needed the force should be increased by using section men rather than have the work train held up for a lack of men.

A work train should be equipped with cars assigned to that service only and should have its own siding for the storage of this equipment. This siding should preferably be located at some outlying point where the train can get in and out without being delayed or causing detention to others. The maintenance of way material yard should be located along this siding. When any large quantities of material are to be delivered by the work train the material should be loaded on the cars the day before in order to be ready for the work train to take out.

The prevailing idea that any engine is good enough for work train service should be overcome, as a work train performs all classes of service, such as shifting, hauling heavy trains, dragging ballast, as well as making fast time. Dispatchers should always notify work trains when a train is late or something occurs on the road that will allow the work train to occupy this or that main track. Work trains should not be used for such work as placing a car on a siding or in a yard when the work can be done just as well by a drill engine making one or two shifts a day without any delay to the drill.

Provide a Suitable Track for The Tying Up of Trains at Night

By C. H. Baltzell,

Superintendent, St. Louis-San Francisco, Sapulpa, Okla.

In planning work trains for only one or two days' work enough consideration is not given as to location of power, convenience, or the furnishing of power or crews for work train service. The heads of different departments requiring work train service should, before arranging for it, find out what would be the most suitable time to use the train and carefully plan work so as to get the greatest benefit from the expense incurred.

In regular work train service the train should tie up as close to the work as possible. When conditions justify a spur track should be provided, since this will allow it to clear the main line for other trains without necessitating a long run to a passing track. Telephone communication with the dispatcher, or where conditions justify, telegraph service should be cut in.

From personal observation, I find that the make up of the train has considerable to do with economical operation. For instance, in distributing ties, it has been my plan to have the roadmaster accompany the train and to have the cars of ties between the caboose and the engine with the engine pushing the train. When distributing the ties the roadmaster, riding on the platform of the caboose, with the train running 8 or 10 miles an hour, is in position to see where the broken or decayed ties are located in the track and can give whistle signals where the train is to slow up and the men are to throw off ties. The same plan is used in unloading ballast. This method keeps the train moving more rapidly, which means economy in the operation of the train.

Why Not a Conductor-Foreman?

By W. C. Bevington

Superintendent, Missouri Pacific, Nevada, Mo.

In the handling of work trains the first question to be considered is that of supervision, which should be provided by the conductor in charge of the train. He should receive some addition to his regular pay and be made a conductor-foreman. This way will enable a railroad to get the choice of conductors and secure a man who likes the work and would be interested in it. It is thought that this will be much more effective than to have a trainmaster and possibly a roadmaster on the train in addition to the conductor, each of them with different ideas. The conductor-foreman would receive his instructions from the division engineer when leaving the terminal. He would then line his train up accordingly and work consistent with train interference. This would eliminate a misunderstanding of orders and instructions after reaching the working point, which might otherwise be given by a roadmaster or section foreman. By an arrangement such as this it is believed that more work

could be done in a day by work train forces than if left to several officers, as the matter is now usually handled.

Ballast, rail, ties, etc., would be assembled at the most convenient point for the work of that particular day and the conductor-foreman would plan as he left the terminal which material should be handled first, depending on the movement of other trains. For instance, he might have a few minutes time before it was necessary to get his train into clear and in this time he might handle some particular material rapidly and get it out of the way and then go into the siding where other material was to be picked up, which he could do while waiting for the regular train. These matters do not work out satisfactorily with several officers in charge, there being too many opinions or suggestions.

Careful Planning Is Necessary

By N. A. Ryan

Assistant Superintendent, Chicago, Milwaukee & St. Paul, Terre Haute, Ind.

The economical handling of work trains is given considerable thought at the beginning of the season but, as the work progresses, the work train is too often lost track of. The crew starts in by getting a few minutes' overtime, which grows rapidly until a great deal of overtime accrues and is paid for before it is checked. In practically every case this could have been avoided and the same results obtained if proper supervision were provided.

To get efficient work with the class of train employees that we must place in charge of work trains requires more supervision and whenever there are two or more trains working in the same territory an assistant roadmaster should be with them continuously and the trainmaster, or assistant trainmaster should visit them at least every other day. This will keep the crews lined up and working in harmony with the engineering, bridge and building or roadway departments. This supervision is necessary at the present time, as we have very few of the old work train conductors left.

The work for the day should be fully planned the night before and the subordinate officer who is in charge of the work should outline specifically to the chief dispatcher exactly where the working limits will be, what work is to be done, where dinner will be taken and other information regarding the operation of the work train that he would be interested in. The chief dispatcher should then leave instructions to his night chief, or his trick men, so the orders for the day will be ready when the work train crew reports in the morning. Necessary wait orders should be out at that time to enable the work train to reach the work without delay for other trains.

The work train crews should be notified where their work will be and it should be outlined so they can plan time-saving moves in advance. When work trains are tied up outside of terminals, a first-class engine watchman should be provided who has the ambition and intelligence to turn the engine over to the crew with a clean fire and coal on the tank. An engine watchman should be able to coal the engine by hand during the night, if no other facilities are available.

The work train should be tied up as near the work as consistent. After the first day the trainmaster should set a stipulated time for quitting and getting tied up and insist that it be adhered to. This plan will discourage loafing by the crew after the day's work is finished. A sufficient number of workmen should be kept with the work train to keep the work moving. They should be in charge of a competent lead man.

A work train is often wanted for one day only, but before it is authorized the person in authority should satisfy himself that it is needed, as in too many cases a work train is ordered without enough work to justify it. It may be found best, if the work is not urgent, to hold it up until two or three days' work can be given to the crew.

The handling of wreck trains is a source of expense and they can be handled more economically in the following manner if the derailment is a large one and at a considerable distance from a terminal. When the wreck train leaves a terminal, deadhead an entire extra crew with it and work the two crews eight hours each. This will greatly reduce the expense, permit a continuous operation of the wreck train and eliminate a lot of worry relative to the hours of service law.

Power suitable to handle the work should be furnished. Nothing is gained by furnishing a small engine on a heavy job and if the job is heavy large power should be furnished. If is is a light job with a lot of short work and running around, light power should be applied. Stoker engines should not be used on work trains. Traveling engineers should make regular visits to work train crews and see that they have the necessary supplies and that the power is in good condition. When at any great distance from terminals the changing of engines for wash-outs can be accomplished by changing off with way freight crews, thus avoiding running in to terminals on Sunday. During summer months an engine at an outlying point on a work train could be killed Saturday night and refired Monday morning.

Outline of Good Practice in Work Train Operation

Economical operation of work trains demands the most efficient supervision on the part of division officers, and, in order to bring about the more economical handling, the matter should be regulated on the following basis:

1. The division roadmaster should be fully informed each morning as to the company material on hand, including initial, car number, contents and destination, and a thorough understanding should be had between the roadmaster, supervisor, trainmaster and chief dispatcher as to the necessity of a train service for handling it.

2. At least 15 hours' notice should be given in advance of the time that a work train is desired.

3. All concerned, including the conductor, should be fully informed as to the character of material that the train is to handle, giving the point at which men will be picked up, and the point where the loading or unloading is to start. This information should carry with it the manner in which the train must be built up.

4. The same interest should be given in dispatching a work train on time as is given to the dispatching of a first-class passenger train, as, in most cases, the time of many men is confined to this work train service, and if it is held at a terminal or any other point, even if for only a few minutes, it results in a large loss in the aggregate.

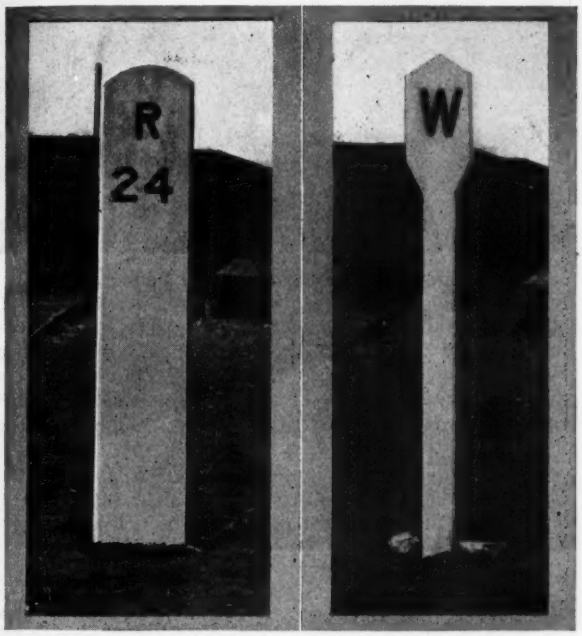
5. It must be borne in mind that, while the money spent for work train service comes out of the general till, it is charged directly to the maintenance of way; and in order that a man in this branch of the service may maintain proper credit and reputation, he should see that he is efficiently served for the money charged for such service.

6. The superintendent, and all other division officers, should give their most hearty co-operation in seeing that efficient work train service is obtained.

Mile and Whistle Posts Made of White Concrete

THE New York Central has recently designed and constructed a new type of mile posts and whistle posts with maximum visibility by utilizing white Portland cement and a white aggregate such as white silica sand and gravel. These posts are now standard for the road and will gradually replace the old cut stone and wooden mile posts and the old wooden whistle posts. The adoption of white cement posts, all of which are reinforced, has effected a considerable saving in first cost.

The new mile posts cost approximately $4.50 each to manufacture. This figure includes labor, materials and forms. The cut stone mile posts cost about twice as much and the old wood type, largely used on branch lines and consisting essentially of timber bolted to pieces



Two Posts Set Up in a Yard to Test Their Visibility

of rail embedded in the ground, cost about $5.50 or approximately $1 more than the concrete. The old wood whistle posts consisted of round posts 9 ft. long, turned from a log to about 9 in. in diameter except for about 3 ft. at one end, which was embedded in the ground. These cost about $6.50 to $7, while those of concrete cost about $4.35, including labor, material and forms.

The mile posts have an overall length of 9 ft. with a standard height of 5 ft. 6 in. above ground and are 14 in. wide and 4 in. think. The letters are 6 in. high with a one-inch stroke recessed ⅜ in. and painted black. The whistle posts are 9 ft. 6 in. long, with a standard height of 6 ft. above ground. They are one foot wide at the sign or enlarged end, 6 in. wide for the post section and 4 in. thick. The letter "W" is 7½ in. high with a 1¼-in. stroke recessed ¾ in. and painted black.

The forms for pouring these posts are substantially constructed for repeated use. The whistle posts are poured flat in a two-part form. The recesses for the "W" are secured by nailing wooden strips in the form. The pouring is done with the forms on edge, the forms being rapped with a hammer as the concrete is poured in order to secure dense concrtee and to prevent imperfections of the surface. The exposed side is troweled to a smooth surface. It was found desirable to rub the surfaces with a little sand and water to remove the skin coat of neat cement that the troweling and suction of the form brought to the surface.

The mixture used consisted of one part of Atlas-White portland cement, two parts of white sand and four parts of white gravel passing a ¾ mesh screen. After

Forms for the Concrete Posts

removal from the forms, the posts are kept wet by sprinkling with water until thoroughly cured and are ready for use in about 30 days.

The new type posts were developed and constructed under the direction and supervision of the maintenance department, J. V. Neubert, engineer maintenance of way. The forms were constructed and poured by company forces at the store yards of the bridge and building department.

Moving a Water Tank on Rollers

THE WATER tank of the Chicago, Milwaukee & St. Paul at Renville, Minn., was moved a distance of 800 ft. on rollers without dismantling. After it had been placed in permanent position on the new site, it was filled with water and was found to have suffered no damage as the result of the transfer. The tank was moved from the site on which it had been erected in 1887 because it obstructed the view of the track at an

The Tank Passing the Station

important highway crossing and because the pipe line by which it was served from the pumping plant was in such condition as to require its renewal. By moving the tank 800 ft. west of its original position, the obstruction of the view was eliminated and the tank was placed close to the pumping plant, thus obviating the necessity for a new pipe line.

The tank was located the standard distance to the south of the track. Therefore the transfer required that it be first moved north so as to center it over the main and passing tracks, then moved 800 ft. west along the tracks and again moved south to proper position alongside the track. As a consequence it was necessary to provide one position of the rollers for moving it to and from the track and another position for moving it in the longitudinal direction. The drawing shows the framing which it was necessary to provide for these rolling operations.

The first step in the work was to bolt 8-in. by 16-in. stringers to the tower posts, as shown in Fig. 1. Next the tank was raised by eight, 15-ton ratchet jacks to permit the placing of rollers and crosswise roller timbers, as shown in Fig. 2. After it had been moved north about 40 ft. the tank was again jacked up and an additional set of roller timbers added which were

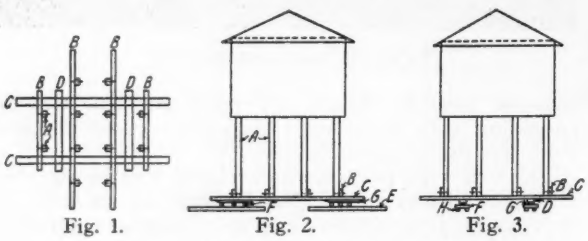


Fig. 1. Fig. 2. Fig. 3.

Framing Provided for the Moving of the Tank

Fig. 1—Plan of the Framing.
Fig. 2—Elevation when Rolling the Tank Transversely.
Fig. 3—Elevation when rolling the Tank Longitudinally.

A—12-in. by 12-in. tower posts.
B—8-in. by 16-in. stringers on edge bolted to tower posts with ¾-in. bolts.
C—8-in. by 16-in. stringers laid flat. Put in when direction of movement was north.
D—8-in. by 16-in. stringers laid flat and put in when direction of movement was changed from north to west.
E—Second-hand timber for roller tracks.
F—Standard 6-in. building rollers.
G—3-in. by 12-in. plank shoe.
H—8-in. by 8-in. ties for roller track.

placed in an east and west direction and the rollers placed under these so that the tank could be moved to the west. In all of the rolling operations two lines of 8-in. by 8-in. by 10-ft. ties, or other timbers, spaced 18-in. apart with broken joints were used for the roller track. The rollers were the 6-in. standard building rollers commonly used for moving operations.

The power for the moving was provided by a team of horses hauling on a one-inch Manila rope rove through a set of double blocks, one of the blocks being attached to the rolling platform under the tank and the other being fastened to the track with a short chain. Four sets of rollers were used, with one man assigned to each set to pass the rollers forward as soon as they were released at the rear of the shoe. In addition, two men moved the bridge ties ahead for the roller track. Each man was carefully coached before the work started so that he knew just what his duties would be and the entire crew carried out the work so well that not a minute was lost in any way.

The layout at the station was such that it was necessary to move the tank along the main track and the passing track, as shown in the photographs. This made it necessary for trains to use the house track in passing around the tank while the moving was in progress. The work was started at 8 a. m. and at 2 p. m. on the same day the tank was resting on the new foundations with the main and passing tracks cleared for the movement of trains. In passing the station it was necessary to

A Team of Horses Provided Ample Pulling Power

raise both the telephone and telegraph cables in order to move the tank under them. This was readily done by providing the necessary slack at both ends and as the tank approached these cables a man standing on the roof lifted them up so that the tank could pass under them.

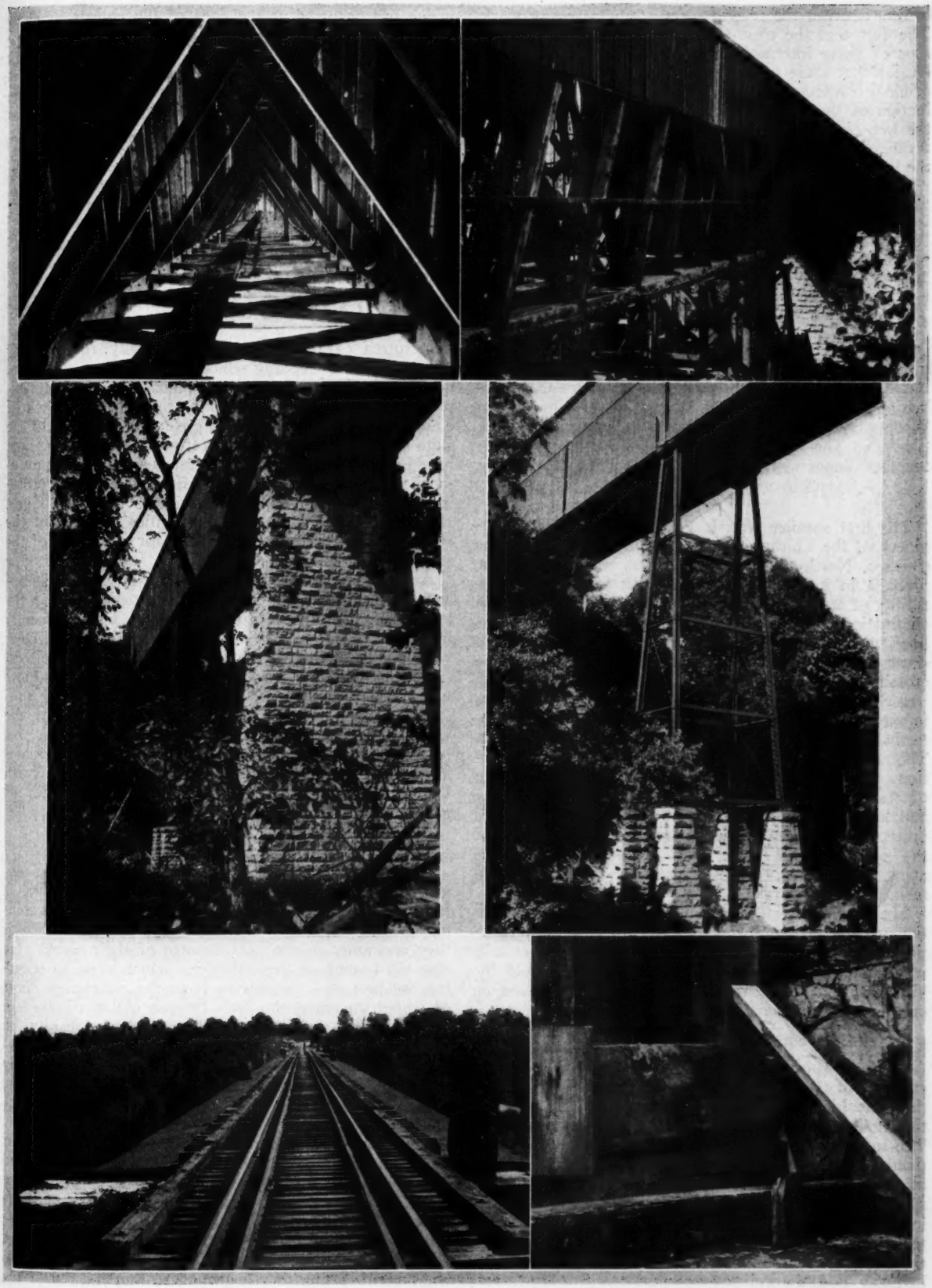
We are indebted for the above information to the Milwaukee Magazine and to V. Hansen, chief carpenter on the Hastings and Dakota division of the Chicago, Milwaukee & St. Paul at Montevideo, Minn.

Timber Bridge Has Long Life

FIFTY YEARS of useful service is the record now being completed by a Howe truss bridge on the Cedar City branch of the Chicago & Alton near Auxvasse, Mo. The timber in this bridge is white pine which, thanks to effective housing, has been maintained in good condition for this long period of use. It is only because of serious decay in the main members at the bearing where they were subjected to moisture from the masonry, together with the enormous increase in loading, that it has become necessary to replace this structure at this time.

The bridge consists of six spans of Howe trusses approximately 108 ft. long supported on two stone masonry T-abutments, two tall stone masonry piers and three wrought iron towers. The trusses carry a single track on the upper deck and have always been thoroughly enclosed on the top and sides. They are 24 ft. deep from top of top chord to bottom of bottom chord and are spaced 17 ft. 3 in. center to center.

Little is known of the construction of this bridge other than that a stone near the base of one of the piers carries the date, 1872. There is also a tradition that one of the spans fell during erection and had to be rebuilt. Of particular interest is the presence of the intermediate



An Interesting Structure

As Seen From the Inside.
The Old Masonry Is in Good Condition.
On the Deck.

Part of the Housing Removed.
One of the Intermediate Towers.
Decay Was Most Serious at the Bearing Point.

towers between the several units of the masonry work. The fact that the truss spans are continuous over the tops of these intermediate towers has led to the conclusion that these towers were added subsequent to the original construction of the bridge. However, an examination of the web bracing of these trusses shows that the web diagonals were either originally or subsequently arranged to accommodate the condition of support at the location of the towers.

One of the photographs shows the nature of the rot which has occurred at the ends of the chords in close proximity to the masonry. The picture shows the condition at the abutments, but the decay has been more marked on the pier and led to the provision for saddles over the tops of the pier as a means of distributing the end reaction of the span over a greater width than that afforded by the pier tops.

The bridge has been replaced by a structural steel viaduct, which utilizes the old masonry but not the old iron towers.

Maintenance of Way Club Discusses Grade Crossing Protection

GRADE crossing protection with particular reference to the supervision of gatemen and watchmen was the subject discussed before the meeting of the Maintenance of Way Club of Chicago on Wednesday evening, June 18, at the Auditorium Hotel, Chicago. The meeting was preceded by the usual get-together dinner with an attendance of about 50.

The Problem

The first speaker was J. W. Stephenson, signal engineer of the Chicago Rapid Transit Company and the Chicago, North Shore & Milwaukee, who outlined the problem in its general aspects. Pointing to the utter futility of any attempt to solve this problem through the elimination of all grade crossings, Mr. Stephenson outlined the various measures which have been taken to decrease the hazard and reduce the casualties at the crossings. After pointing out briefly the steps which have been taken to educate the users of the highways to exercise greater caution he described the various protective methods followed in making the crossing safer. This covered the improvement of the physical conditions surrounding the crossing, such as the realinement of the highways, the moving of obstructions to view and improved grades of highway approaches; and the protective measures taken to indicate the presence of the crossing and to warn users of the highway of the approach of trains, such as colored signs, alarms, watchmen, gates and barriers.

Mr. Stephenson devoted considerable time to explanations of the various forms of gates used by the properties on which he is employed, illustrating his remarks with lantern slides and with a moving picture of the yielding barrier type of protection which is in use on one crossing on the Chicago Rapid Transit lines.

Obstacles to Standardization

The next speaker was R. M. Phinney, assistant signal engineer of the Chicago & North Western, who outlined the difficulties which confront the efforts at standardization and improvement in highway crossing protection. The individual railway has a government which is distinctly a monarchy in that standardization can be quickly affected by an explicit ruling from the officer in responsible charge. However, in a country such as ours in which the question of highway grade crossing protection involves not only the railroads and the users of the highways but is subject to regulation by both the highway and the railway commissions in the several states, the Interstate Commerce Commission, as well as the individual municipalities, it is exceedingly difficult to secure the adoption of any specific standards.

Much of the difficulty arises from the fact that certain forms of protection are specifically required by statutes of long standing which must be repealed before new standards may be set up. Another obstacle to improved grade crossing protection arises from the lack of co-operation on the part of the governing bodies. In the state of Illinois, for example, certain highway crossings have been designated as so dangerous as to require automobiles to stop before crossing the tracks, these crossings being marked by distance signals and stop signs. However, although the local authorities throughout the state are authorized to collect fines for violations of the stop rule, this is rarely done.

Another difficulty encountered in providing standardized protection arises from the interference of the local authorities in the cities and villages who frequently insist on added protection at crossings where a clear view makes additional warning signs entirely unnecessary, thus diverting large sums of money to no purpose which could well be expended in providing better protection where it is sorely needed. Some idea of the vastness of the problem imposed on the railroads in protecting grade crossings is to be had from the statement made by Mr. Phinney that the Chicago & North Western spends $1,000,000 annually in the wages of gatemen and watchmen at crossings.

Supervision of Gatemen and Watchmen

The third speaker was S. J. Steiner, assistant engineer maintenance of way, the Chicago, Aurora & Elgin at Aurora, Ill., who outlined the crossing watchmen's and gatemen's duties and the difficulties which they encounter in the performance of their work. He also cited some of the difficulties which arise in securing the best possible service from the watchmen, most of whom are men who have become old or disabled in the service of the railroad. The principal difficulty, he said, is in getting the men to act quickly enough in lowering gates and getting out onto the highways. Many of the men dislike very much to take a position in the center of the road because this places them in serious danger of being hit by automobiles and bad accidents of this nature frequently take place. The proper use of the hand or stop signal is also difficult to obtain. The men will often hold these signs carelessly so that the view from one direction or the other is obstructed by their bodies. This, he said, has been overcome on the Aurora & Elgin by mounting the sign on a six-foot staff which the man holds in a vertical position with the bottom resting on the ground so that the top of the sign is well above his head. Another fault in watchman service against which every precaution must be taken is the tendency of the watchman either to warn drivers away or call them forward by the giving of a

hand signal. Such signals are often misinterpreted or form the basis for false testimony in damage suits wherein the plaintiff claims that he had been signaled to proceed, with the result that an accident took place. The only cure for this practice is to give explicit instructions that the watchman is to give no signals of any kind with his hands and when the track is clear he should return to his shanty without giving any signal at all.

Discussion

President F. W. Hillman (division engineer, Chicago & North Western) gave an interesting account of his experience in supervising crossing protection on the heavy traffic line between Chicago and Milwaukee, which is crossed by many highways carrying exceedingly dense traffic. One feature of the crossing watchmen's work which is frequently overlooked is the constant abuse to which he is subjected by users of the highways, who object to the manner in which he carries on his work, particularly to a failure in their opinion to raise the gates with sufficient promptness. The work of the watchman, he said, calls for the exercise of considerable judgment with respect to the speed of the trains, but the only rule which the watchman can follow safely is to assume in any case of doubt that the train approaching is a fast one. He referred at some length also to the co-operation between the railroads and municipalities along the lines. Criticisms of the watchman service, he said, should be followed up immediately with courteous explanations to the authorities and tactful suggestions with respect to ways in which the municipalities can aid in effective work. Diplomatic criticisms of the behavior of some of the local users of the highways are often effective in shutting off unwarranted complaints on the part of the local authorities.

In the course of discussion by others present at the meeting it was brought out that much of the difficulty in protecting crossings by watchmen and gatemen lies in the fact that they do not command the respect of the highway users. The suggestion was made that the watchmen be given police powers, indicated by the wearing of a uniform and star. This practice is not favored by the local authorities and very few of the railroad officers present were inclined to feel that this would be the best solution. However, a number of illustrations were cited of cases where uniformed policemen regularly attached to the local police forces but paid by the railroad are performing excellent service as crossing watchmen because their presence represents authority which the average driver does not disregard.

How Rail Expansion Actually Occurs

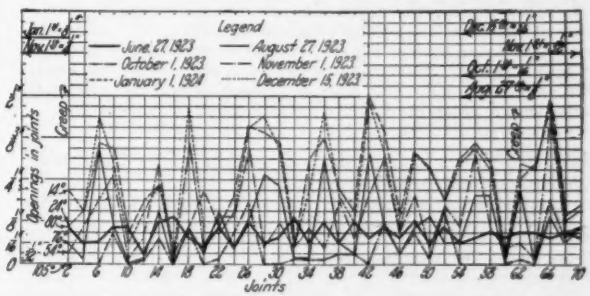
HUNTER McDONALD, chief engineer of the Nashville, Chattanooga & St. Louis, is conducting an interesting study of rail expansion on a stretch of track on the Chattanooga division of that road which has developed some specific information concerning the manner in which the change which occurs in the length of a rail with variations in the temperature is taken up by expansion in the joints. The test has not been entirely completed but the following progress report, which Mr. McDonald submitted as a discussion of the report of the Committee on Rail at the convention of the American Railway Engineering Association in March, contains valuable information concerning the manner in which the expansion is distributed and the extent to which joints are a factor in this action. He also offers some conclusions with respect to the efficiency of rail anchors, the effect of the use of longer rail and other related subjects.

The stretch of track, 1.22 miles, selected for the test lies along the edge of a creek bottom. The grades are undulating, having three summits in clay and limestone cuts. The gradients are one per cent, with three level stretches. The embankments average seven feet in height. One-half mile of track is on tangent; 2,000 ft. is of 3-deg. curve to the right and 1,750 ft. of 4-deg. curve to the left, the curves reversing on a point but having short spirals.

Character of Track Construction

The track is well ballasted; the ballast is not shouldered; the underlying soil is clay; ties are in good condition; and the rail is 110 lb., rolled by the Tennessee Coal, Iron & Railroad Company at Ensley, Ala., in April, 1923, and laid in June, 1923. Hipower nutlocks were used and the joints were wrenched up in the usual way, no special effort being made to secure uniform bolt tension. The joints consist of plain angle bars, heat treated and oil quenched, with heat treated rolled thread bolts one inch in diameter. The track is tie-plated throughout with 7-in. by 10¼-in. plates, canted 1 in 40. No spikes were driven in slots and ties were not respaced to provide for suspended joints. Rail anchors were applied throughout, six to each rail, three facing in each direction. The expansion allowance was in accordance with the A. R. E. A. standard. The temperatures were taken on the rail with a rail thermometer.

Reference hubs were set on each side at intervals of 1,000 ft. and in such a way that by stretching a cord any creeping could be determined accurately. The joint openings were calipered on June 27, 1923, as quickly as possible after laying. The average temperature of the east rail was 81 deg. F., and of the west rail, 88 deg. F. The total calculated expansion space, under the rules, for the east rail was 1 ft. 3½ in. while the measurement showed 1 ft. 4-25/32 in. For the west rail, the total calculated expansion space was 1 ft. 3¾ in., and the measurement showed 1 ft. 4-21/64 in.



A Short Section of the Rail Expansion Chart

Additional observations were made on August 27, at which time the temperature of the rail was 76 deg. F. After this observation, the joints were oiled by running the spout along the top edges of the splices. Other observations were made as follows: October 1, with an average temperature of 109 deg. F.; November 1, average

temperature 60 deg. F.; December 15, average temperature 32 deg. F.; January 7, 1924, average temperature 26 deg. F. The rail creep at each reference point was noted at each observation. The greatest creep noted was ⅜ in. At all points except one, what creeping was observable was in each direction.

How Expansion was Distributed

Comparison between the calculated expansion allowance at the various temperatures with the allowance actually measured showed very close agreement. The openings in the joints to the nearest 1/16 in. for each rail, at each observation were plotted on a chart with a verticle scale of ⅛ in. and a horizontal scale of 2⅔ rails per inch. Each observation was plotted in differently constructed lines. A study of the peaks and valleys on this chart shows a tendency of certain joints to remain open and others practically closed.

1923 Date of Observation	Average Temperature of Rail, Degrees F.	Calculated Linear Expansion or Contraction	Total Measured Spaces in Joints	Total Measured Spaces Eliminating Creeps at Ends	Total Calculated Spaces in Joints	Excess Measured Over Calculated Spaces
EAST RAIL	Total theoretical spaces by rules for laying —		(1' - 3⅜")			
June 26, 28	81.175	(Rail laid)	1'-4-25/32"	1'-4-25/32"		6-1/8"
July 12,	93.466	5-49/64"	1'-5-9/64"	1'-5-9/64"	11-1/64"	11-29/32"
" 26,	118.	1'-5-1/4"	11-13/16"	11-7/16"	-(0-15/32")	6-1/8"
Aug. 13,	101.8	9-21/32"	1'-1-5/32"	1'-1-1/4"	7-1/8"	6-37/64"
" 27,	76.466	-(2-13/64")	2'-1-29/32"	2'-1-9/16"	1'-6-63/64"	5-11/16"
Oct. 1,	108.75	1'-0-29/32"	9-9/16"	9-0/16"	3-7/8"	8-31/64"
Nov. 1,	60.156	-(9-27/32")	2'-11-13/64"	2'-11-7/64"	2'-2-5/8"	7-27/64"
Dec. 16,	32.093	-(1'-10-63/64")	3'-10-29/32"	3'-11-3/16"	3'-3-49/64"	
Jan.7, 24.	25.531	-(2'-2-1/16")	4'-1-3/32"	4'-0-31/32"	3'-0-27/32"	6-1/8"
WEST RAIL	Total theoretical spaces by rules for laying —		(1'-3-3/4") Note-A.			
June 27,28	88.632	(Rail laid)	1'-4-21/64"	1'-4-21/64"	1'-2-1/16"	1-57/64"
July 13,	93.466	2-17/64"	1'-3-21/64"	1'-3-21/64"	2-25/64"	6-27/64"
" 26,	118.	1'-1-25/32"	8-7/8"	8-13/16"	1-25/32"	1-29/64"
Aug. 13,	101.8	6-11/64"	10-53/64"	11-49/64"	10-5/32"	1-37/64"
" 27,	76.466	-(5-15/64")	1'-11-37/64"	1'-11-39/64"	1'-10-1/32"	1-1/16"
Oct. 1,	108.75	9-7/16"	8-5/64"	7-61/64"	6-57/64"	2-25/64"
Nov. 1,	60.156	-(1'1-3/8")	2'-7-21/32"	2'-8-3/32"	2'-5-45/64"	1-5/16"
Dec. 16,	32.093	-(2'-2-35/64")	3'-8-1/16"	3'-8-3/16"	3'-6-7/8"	0"
Jan. 7,24,	25.531	-(2'8-41/64")	3'-9-49/64"	3'-9-31/32"	3'-9-31/32"	

NOTE-A: This amount allows for 1/32" space per joint where temperature was 106 deg. and for which the rules require to be laid "close".

Summary of the Expansion Study

This table shows the relation of the total expansion in 182 rails on the east side and 182½ rails on the west side. The second column shows the temperature. The third shows the calculated expansion or contraction as obtained by multiplying the change in temperature by the total length of rails and by 0.0000065. The fourth column shows the sum of the actual measured spaces in the joints. This is corrected for creep in the fifth column. The sixth column gives the theoretical or calculated space in the joints at each temperature as obtained by adding the calculated contraction to or subtracting the calculated expansion (shown in the third column), from the amount of space left in the joints when they were laid. The seventh column shows the excess of the measured space over the calculated space.

The extent of the movements of the rails through the joints since the first two weeks after laying to an amount not over ⅛ in. was as follows:

	East Rail Per cent	West Rail Per cent	Total Per cent
No movement	1½	3½	2½
Movement of only 1/16 in.	5	10	7½
Movement of only ⅛ in.	17	13	15

A number of joints which showed a movement at first of ⅛ in. have exhibited no movement since. The widest opening observed was ½ in., and the number of this width was: East rail, 17; west rail, 19; or 9 per cent and 10 per cent, respectively.

Considering the joints showing a total movement of 1/6 in. or less between the extremes of temperature as frozen or so tightly bolted as not to admit of movement, the following single and multiple "rail lengths" were observed: East rail, 137 rails, 33 ft. long; 19 rails, 66 ft. long; 5 rails, 99 ft. long; 1 rail, 165 ft. long. Average length of single and multiple rails, 40 ft. On the west side, there were 110 rails 33 ft. long; 16 rails, 66 ft. long; 7 rails, 99 ft. long; 3 rails, 132 ft. long. Average length of single and multiple rails 44 ft.

Will Continue Observations

No further observations will be made until extreme temperatures of the summer are reached. However, the rail will be watched for any exhibition of a tendency to creep. It is expected that all of the joints will be closed up when the temperature exceeds 100 deg. F., and when this occurs, the joints which have previously exhibited a tendency to remain open will be wrenched tight and those having shown a tendency to remain tight will be slackened in order that the expansion openings may be distributed more accurately. The average number of freight trains passing over this track in 24 hours has been 18, hauling an average of 1,350 tons, and the average number of passenger trains has been 10.

The observations so far made seem to warrant the following conclusions: (1) That it is entirely practicable to prevent rail creeping on single track by anchoring in both directions, (2) that a 45-ft. rail need give no serious trouble from expansion openings, (3) that there is no necessity for spiking rails in the slots, (4) that the standard expansion allowances appearing in the Manual of the American Railway Engineering Association are correct.

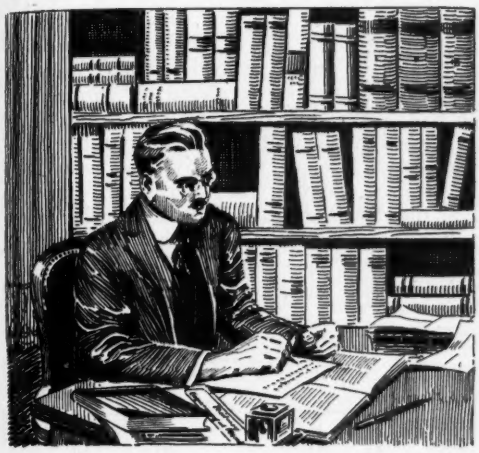
Valuation Work to Go On

Washington, D. C.

PRESIDENT COOLIDGE has approved a plan which will obviate the necessity for a sharp curtailment in the work of the Bureau of Valuation of the Interstate Commerce Commission as a result of the failure of the Senate to pass before adjournment the conference report on the deficiency appropriation bill which carried a supplemental appropriation of $350,000 for valuation work. The commission's regular appropriation, including $647,000 for valuation work, was passed but the commission showed that this amount would require a curtailment of its work and a reduction of its valuation forces from about 425 employes to about 244, at just the time it was desirable to devote special attention to bringing up to date the valuations of roads believed to be near the recapture point. Accordingly, the President recommended the additional item which was in the bill as it passed both houses of Congress, but which was not made available because of the filibuster conducted by Senator Pittman in the closing hour of the session.

Under the plan approved the commission will apportion the expenditure of $647,000 which has been appropriated so that $255,000 may be used in each of the first two quarters of the fiscal year ending June 30, 1925, and $90,000 and $47,000, respectively, in the next two quarters. This will make it possible to proceed with the work during the next six months at about the same rate of expenditure as would have been allowed if the total of $997,000 had been appropriated, without actually spending any money that has not been authorized by Congress. It is assumed that Congress in December will pass the bill so as to fill out the amounts available in the second half of the fiscal year, as there was no objection to the valuation item in the bill. If Congress should fail for any reason to pass the bill the commission would almost have to close up its valuation work, but the plan adopted will make it possible to continue the work for the present at least.

What's the Answer?



This department is intended to help our readers secure answers to the questions which arise in their work in the maintenance of tracks, bridges, buildings and water service. An endeavor will be made to answer promptly by mail, any questions received. Such questions as are of general interest will also be submitted in these columns for further discussion. *Railway Engineering and Maintenance* solicits the co-operation of its readers in answering the questions which are published.

Questions to be Answered in the September Issue

1. When burning the right-of-way what precautions should be taken to avoid setting fire to poles and posts?

2. Under what conditions, if any, may water be chemically treated in reservoirs and how should the work be done?

3. To what extent is it practicable to dispose of old ties to residents along the line? What objections, if any, are there to this practice?

4. When building concrete roadways to serve team tracks, etc., should the surface be crowned, and if so, how much? Should the sub-grade also be crowned?

5. How often should track carrying a heavy high speed traffic be surfaced out of face if ballasted with gravel? With rock?

6. Do steel boiler plates make suitable freight house runways where the trucking is heavy? What thickness should be used?

7. Is there any merit to the suggestion that a foreman should start renewing ties at the end of his section most remote from his headquarters and work continuously over his section?

8. Is it advisable to place struts in culvert pipe when laying until the fill is thoroughly compacted?

What to Do With Ties Removed By Mistake

What should be done with crossties which are found to be in sound condition after they were removed?

In general there are three conditions under which crossties might be removed before their life is spent, (1) by mistake, (2) where the ties are found in a fair state of preservation but are badly rail cut or (3) where they are removed when rearranging or tearing up existing tracks. Obviously the condition under which a tie is removed will govern somewhat as to what should be done with it. It is a different problem, for instance, to dispose of a few ties removed here and there by mistake than where large numbers of sound ties are removed in rearranging tracks. The class of track from which the ties are removed and the standard of maintenance are factors to be considered and these conditions vary on different roads.

The most important thing to remember in a discussion of this character is, to quote J. B. Martin, general supervisor of track on the New York Central, Lines west, that "sound ties should not be removed from track in the first place," and as A. Brittenham, foreman on the Great Northern at Kootenai Falls, Mont., says, " a good track foreman seldom removes a tie which is fit for further use." When they are removed, J. W. Powers, supervisor of track on the New York Central at Rochester, N. Y., answers the question as follows: "They should be put back in track and steps taken to avoid a recurrence. When sound ties are removed on account of rail cutting, they should be turned over and used in sidings. Excessive rail cutting of serviceable ties is often the result of the adjacent ties not furnishing their share of the rail support. All ties should be tamped uniformerly so that the rail support will be uniform. This will result in better riding track and will prolong the life of the rail and ties."

A. Brittenham, of the Great Northern, also would take all ties removed from main line to the nearest siding or passing track, because as he says: "A tie removed by an experienced foreman will certainly not be worth the time and cost of replacing in the main line, while it may last one or two years more in a side track." James Vitato, extra gang foreman on the Belt Railway, of Chicago, particularly emphasizes the fact that "it is poor economy to place such ties in stone ballast, or under crossovers or railway crossings as that requires much labor which must be repeated in a few years."

With further reference to the life obtained from old ties, Nick Batina, foreman on the Pittsburgh & Shawmut, at Timblin, Pa., claims that some second hand ties are good for three or four years service in sidings, while James Vitato, says that "a tie good for but two year's life in main line service will last for six or eight years longer if placed in straight secondary track under light traffic." This is particularly the case with ties removed for mechanical wear.

Where ties are replaced in track, George E. Kessler, roadmaster on the Texas & New Orleans, at Beaumont,

Tex., Nick Batina and James Vitato agree with J. W. Powers, that the ties should be turned over, but J. Azzuolo, foreman, Canadian National, has the following to say on this point: "Under no circumstances should the tie be turned upside down. The changing atmosphere causes the tie to kink and makes it less resistant to the rail wear than when used before." J. Azzuolo agrees with Nick Batina and George Kessler, however, that in all cases the spike holes should be plugged before the tie is replaced and adds that "the tie should be replaced the same day or not later than the second day after it is taken out."

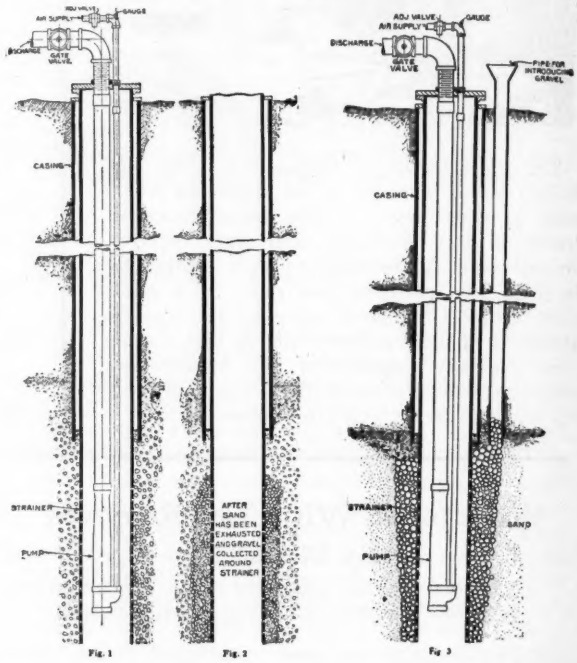
Where ties are decayed too badly for the track and still have sound parts it is the recommendation of J. B. Martin that they be cut into blocking, while Nick Batina also mentions their value for cribbing in order to keep the roadbed from sliding in soft places. An additional use for such ties is suggested in the following statement of George E. Kessler. "I have used a great many sound ties in securing soft spots in roadbed caused by water pockets forming underneath the track, by digging a trench about one foot from the ties parallel with the track and excavating through the water pocket into the solid foundation below. The ties are laid one upon the other at about a 45 deg. angle to form a solid wall, after which the ground is backfilled and tamped firmly around the ties. There are places where the above method will not apply, but in these cases the ties are used to advantage in putting in drains where soft spots are encountered in fills. This is done by starting at the foot of the fill and digging a trench about four feet in width into the waterpocket, where the ties are used to build a solid wall on both sides of the trench, which is then filled with rip rap. The ties prevent the trench from caving in and the earth from filling the crevices between the rip rap, thereby preventing free drainage of the water pocket."

Increasing the Flow of Wells With Air

Under what conditions can air be used advantageously in restoring the flow of a well and how should this be done?

When a cased well ceases to furnish the quantity of water which it was customary to obtain from it, the cause may either be an approaching exhaustion of the quantity of ground water available in the vicinity or an increased frictional resistance met by the water in its flow to the well, or both. This increased resistance may result from one or all of several causes. Frequently it develops merely that the strainer in the well has become clogged by lodgment of sand grains in the apertures provided for the passage of water. More commonly the trouble arises from the packing of fine sand around the strainer. Another source of trouble is the accumulation of sand inside the strainer or, where no strainer is used, the gradual filling up with sand from the well where the casing penetrates the water bearing stratum, thus reducing the pumping surface and thereby so increasing the suction on any unit area as to accelerate the filling process. These are all conditions where the use of air as a corrective measure may prove of distinct value, whether the well is normally air operated or mechanically operated. The advantage of air in such cases arises from the ability to force it backwards through the well and the water stratum, whereby a surging action is set up which has the desired scouring action upon the deposits.

The following explanation of this process, which is called back blowing, is furnished from information prepared by John Oliphant, chief engineer of the pneumatic pumping department of the Sullivan Machinery Company, Chicago, and J. H. Dillon, of the air lift department of the Ingersoll-Rand Company, New York. The well should first be piped as for air lift operation, that is, the proper sizes and lengths of discharge and air pipes should be installed, together with a foot piece. The top of the well should be sealed, when the arrangement will be that shown in Fig. 3. Assuming a position where the strainer in an old gravel or sand well has become clogged, the process consists of forcing air through the foot piece while the valve on the discharge pipe is kept closed to prevent water flowing from the well. By so doing, the air will drive the water out through the strainer, floating the finer sand. After a short interval the discharge valve is opened, whereupon the flow will resume its course into the well and out through the discharge pipe bearing a portion of the floating sand with it. The scouring effect produced by



Diagrams of the Method and Effect of Back Blowing Sand-gravel Wells

alternately shutting and closing the discharge valve will clean out the openings in the strainer, the length of time required depending upon the hardness of the deposits.

The same method of back blowing and surging of the water is followed where it is desired to break up sand which has become caked around the outside of the strainer, the effect being to draw the fine sand into the well and out through the discharge pipe and to leave only the coarser gravel around the well, thus permitting an increased flow of water into the well. Fig. 1 illustrates a stratum that carries a limited amount of gravel in fine sand, while Fig. 2 illustrates the result of the process of removing this sand and leaving only the gravel around the strainer, as accomplished by the back blowing process. Fig. 3 illustrates the introduction of gravel into a fine or quick sand stratum where the desired amount of gravel is not present naturally to protect the well from repeated trouble from sanding.

Where a well has been partially filled up with sand the corrective process consists of lowering the air lift foot piece to within a few inches of the sand and pump-

ing with air at as rapid a rate as possible. The inrush of water into the foot piece carries a certain amount of the sand with it, which is thereby discharged. As the sand is removed the foot piece is gradually lowered until all of the sand is cut out and carried to the surface. Where the sand is tightly packed frequent back blowing will serve to loosen it preparatory to removal.

In cases where the sand has accumulated in the well to the full height of the strainer or more, or in cases where no strainer is used and the sand has packed so hard in the casing that the head of water in the outlying stratum is not sufficient to force enough water through to supply the water for cleaning the well, the work then requires that water be injected into the top of the well between the casing and the air lift pipes until the well has been cleared enough to permit back blowing without it. In starting the back blowing operations under such conditions a low pressure and a short period of application should be used to prevent any sudden inrush of sand. This process sometimes requires days where the sand is fine and has little gravel in it, but will usually work out satisfactorily.

Occasionally it develops that repeated and frequent sanding up of a well is attributable to a surging action in the well resulting from the reciprocating action of mechanical pumping methods. In this case the solution may be the substitution of the mechanical operation by a permanent air lift operation or by centrifugal pump in order to secure uniformity of draft in the well. Permanent air lift operation will usually also be desired where, in spite of any method of pumping, frequent sanding occurs, as in this case there is always present the means of pumping out the sand or of back blowing the well. In cases where it is intended to provide permanent air lift operation but where the well is deeper than necessary to install the foot piece to get the desired submergence, it may prove desirable to connect a tail pipe to the foot piece below the inlet of the foot piece to prevent sand from collecting in the bottom of the well.

The Desirability of Track Center Stakes

Are permanent track center stakes or monuments desirable? If so, at what intervals should they be placed?

It has been my experience that permanent track center stakes or monuments are not practicable. At an earlier period considerable work of this kind was done but to my knowledge it is not the usual practice now except perhaps on roads that are very highly maintained. We used to put such stakes in at curves, setting one center stake at the beginning and end of spirals, but a difficulty is that any ordinary stake in the center of the track is apt to move if the track itself moves. Dislodgment is especially apt to occur if the stake sticks up above the top of the ties where it can be struck by anything dragging on trains, while if it is set low, it will be buried when the track is surfaced out of face.

Under some conditions permanent track center stakes may be set to one side of the track, but again if they are set close enough to the track to be convenient for the trackman and high enough to avoid errors in measurement, they are quite likely to be in the way of work equipment, and on fills, etc., where center stakes are most needed they cannot be considered any more permanent in their location than the track after settlement has occurred.

The better plan, particularly where the engineering force is not large seems to be to place permanent monuments only to point out the beginning of curves and to rerun track centers only where needed. On the Rock Island this is done by the engineers when new rail is laid and also when the condition of curve makes it advisable. This arrangement requires less time on the part of engineers and appears to be entirely satisfactory to the track department. The stakes, of course, are left in the curve and can usually be relied upon by the track man for some time after they are set, but they are not considered of a permanent character. The only permanent monuments are sections of old rail set six feet out from the inner rail of the curve and two feet out of the ground to mark the beginning and end of the spirals, and the P. C. C. in compound curves. These stakes also serve to show the degree of curve.

C. A. MORSE,
Chief Engineer, Chicago, Rock Island & Pacific.

Longer Rails for Track

What are the reasons prompting the use of longer rails? What are the limitations?

First Answer

The advantage of longer rails is the elimination of many joints. Every track man knows that rail joints require more upkeep than any other part of the track. This fact, together with the cost of securing and installing the extra fastenings required by the shorter rails, makes it desirable to use longer lengths. The disadvantage of the longer rails is the difficulty in handling them and the increased amount of opening which must be left for expansion. The temperature of the locality in which the rails are to be laid will determine to a great extent what lengths of rail may be used without affecting the tracks injuriously.

J. W. POWERS,
Supervisor of track, New York Central, Rochester, N. Y.

Second Answer

The reasons prompting the use of longer rails are the reduction in the number of joints and the reduced injury that results thereby to the subgrade and also to the rolling stock. The local climate, the condition of the subgrade and the treatment the rail will receive in the track must be considered, as well as the extra cost of handling the rail. The local climate and the method of keeping up the roadbed are important factors because longer rails will not stand up under poor maintenance as well as short rails. It is also my opinion that they are more expensive to lay and to keep in position, but within the last year I have seen long rails giving the best of service in France and Italy which have been laid since 1880.

J. AZZUOLO,
Foreman, Canadian National, Foleyet, Ont.

Third Answer

The reasons prompting the use of longer rails are quite obvious. The reduction in the number of joints, with the consequent saving in first cost and maintenance charges, are the most important of these reasons. The limitation on the use of longer rails is, in the writer's judgment, almost entirely the question of economical transportation from the mills, as some lengths might require transit in two cars, which would not be desirable as neither car could be loaded to capacity and some types of cars now available could not be used at all. I do not regard expansion as a serious argument against the use of long rails.

Why railroads have been unable to get longer rails is a more important question, perhaps, than the one stated. To explain why, a little history is necessary. Not so very long ago, cars that were over 32 or 33 ft.

in length were rare. Then, the standard rail was 30 ft. long. As larger and heavier equipment came into use it was found that rails could be made 33 ft. long and that has been the standard for 25 or 30 years. During this time most of the rail mills have been either built or rebuilt. Thus the mills are invariably equipped for making 33 ft. rails; the distance between the stands of rolls, the hot saws, the hot beds (or cooling beds as they are sometimes called), the straightening presses, drills and inspection beds, all being carefully arranged for this length, or a multiple of it. Perhaps the hot saws and hot bed arrangements are the most important of these features. To those familiar with mill conditions, it must occur at once that cutting 39 ft. rails, for example, introduces difficulties which tend to slow up their production rate. There are some exceptions, but these are the conditions at the Gary, Lackawanna and Edgar Thomson mills and, in general, at the Tennessee mills. Decreased production, therefore, has been the direct reason for the extra price asked for long rails by the mills.

To a certain extent long rails may be more difficult to handle at the mill, requiring perhaps two men where one is now employed. Perhaps their straightening will present new problems, but all these details can be met. The fact remains that, for a mill like Gary (built in 1908), to make 39 or 40 ft. rails as a standard, will require the expenditure of a very large sum of money for almost a complete reconstruction of the hot beds and cold finishing department. This may mean a temporary shut down, and altogether the subject cannot be considered lightly. While no one can say definitely what the future holds, I believe that if there is a concerted movement by the roads for longer rails the manufacturers will not be found lacking in efforts to meet the demand. The words "concerted movement" must be emphasized and complete unanimity of opinion must be reached as to the proper standard length, for unquestionably a great deal of confusion and trouble is bound to occur if some roads want rails of one length and other roads of other lengths.

C. W. GENNET, JR.,
Robert W. Hunt Company, Engineers, Chicago.

Painting After Rain

How soon after rain is it safe to paint frame buildings?

In general it is safe to paint a frame building as soon after a rain as the surface of the boards become dry to the touch. When this condition is obtained will depend on several things. The kind and grade of lumber and the seasoning, the kind of grain, the climate, whether the building has been painted before, whether it is a first or second coat which is being applied, the importance of the building, all these are important factors. If a poor grade of lumber is being used it is likely to be more porous and will therefore soak up water quicker and in greater quantity than high grade lumber. Wood that is not well seasoned may not dry out as fast after rain as a well seaoned wood. If the surface is already painted the surface will become dryer much sooner than when there is not coating to keep the water from soaking into the wood. If the rain is heavy and prolonged it is out of the question to paint for a considerable time because of the soaking suffered by the boards. Under such circumstances a bright sun may dry the surface quickly but it may be much later before the wetness has disappeared from the ends and edges of boards, as where lapped siding is being painted. It is usually not necessary to discontinue painting, however, unless the rain is actually striking the boards. There is little to fear merely from moist air. Often it is possible to continue painting right through a rain storm by working on the protected portion or side of the building. The climate is of importance when there is a heavy dew or particularly where a frost is likely to set in after the rain. In the latter case, the possible damage to the painted surface may justify painting even before the surface of the board is entirely dry, or again if the rain is likely to continue for several days there is often justification for painting even while it is raining. In this case the additional turpentine to the first coat will usually forestall any trouble from peeling, as the turpentine penetrates the wood.

It is true that the boards may not be thoroughly dry when the surface is dry but any interior dampness of the wood is of no consequence from the painter's standpoint since, in a frame building, the drying will be completed naturally from the inside. It is only important that the surface of the boards be thoroughly dry to give a perfect bonding of the paint with the lumber. An experienced painter has no difficulty in determining when the surface is ready for painting but in general it may be said that a new frame building should not be painted for 12 hours after a rain of any consequence.

C. E. ETTINGER,
Supervisor Bridges and Buildings, Illinois Central, Chicago.

Overhauling Track Annually

What are the advantages, if any, of giving a certain portion of the track of each section a thorough overhauling each year?

First Answer

In order to secure economical and satisfactory maintenance, it is my opinion that a certain portion of a foreman's or a supervisor's territory, particularly main track, should have a general overhauling each year, comprising general surfacing, replacing of such ballast as requires replacing or adding additional ballast, putting in new ties and doing general lining work. The advantage of this is that it permits more or less cleaning of ballast, the re-establishing, equalizing and distributing of the load which comes upon the various ties, and the spreading of the work of maintenance, so as to avoid an overload of work in certain years. The extent of territory which should receive a general overhauling, depends to a large extent on the traffic.

J. V. NEUBERT,
Engineer Maintenance of Way, New York Central, New York.

Second Answer

To maintain smooth ballast track, it is necessary to provide for a general raise or running surface out of face every three or four years and when this is done such the renewals should be made as are necessary to avoid any digging in of ties until another raise of track is necessary. If the track is ballasted with broken stone, it should be shoveled out and screened back into the track at this time. If this is done a light lift of one or two inches, tamped with air tampers, will provide a smooth and solid track that will require little maintenance for three or four years, depending on the condition of the subgrade. There are many miles of such track on the Lehigh Valley which requires no attention for the full period between surfacing.

The result of digging in ties is that the old bed is broken and it is difficult to escape having loose ties, while, where the method of periodically giving the track a light running surface when renewing ties is followed, all of the ties are retamped evenly and the old bed is not destroyed, providing care is used in the work. First class track can be obtained only by putting the track in first

class shape at the start and this can be done in no other way than to take a section of track at a time and overhaul it out of face. It costs no more to maintain track in this manner than it does to spot the entire section each year and such track will stand up long enough so that other sections of track can receive the same treatment in their turn.

G. L. MOORE,
Engineer Maintenance of Way, Lehigh Valley, Bethlehem, Pa.

Other Answers

J. Azzuolo furnishes another point in support of a thorough overhauling of a portion of track on each section each year by emphasizing the effect on drainage conditions, his opinion being that a track which is not overhauled periodically does not drain properly after rains and is subject to excessive heaving during cold weather. Nick Batina, foreman on the Pittsburgh & Shawmut at Timblin, Pa., says that a track that is overhauled each year does not require as much labor to keep up as is the case where the track is let go for a season or two. Both of these men, moreover, favor overhauling as improving the appearance of the track to the travelers. It is the opinion of A. Brittenham, foreman on the Great Northern at Kootenai Falls, Mont., however, that overhauling of a part of a section should not be done unless soft spots or sags are encountered. His reason for this opinion is gathered from an experience which he describes as follows:

"On the west end of my own section there is 1½ miles of track, practically all of curves, ranging from 4 to 8 deg. In the fall of 1921 all of these curves were surfaced by the aid of tamping picks, since which the principal job has been merely that of renewing the ties. During the same period the remaining 6½ miles of the section has been graveled and given from 2 in. to 8 in. raise on two occasions, but still it does not ride as well as the 1½ miles of spot surfaced track."

Repointing Old Masonry

What precautions are necessary to secure good results in repointing old stone masonry piers and abutments?

First Answer

The repointing of old stone masonry can be likened to the re-painting of steel and iron, that is, both processes are more observed in the breach than in the performance. Money cannot be spent to better advantage than in constant and thorough repointing of old masonry. The useful life of much old masonry could have been prolonged materially if it had been properly pointed at all times. Even though repointing has been neglected, old masonry which apparently has reached the end of its usefulness can in many cases be continued in service for many years if properly pointed. Inspection of much old masonry would seem to indicate that little or no mortar has been used in the joints, or a poor grade of mortar, perhaps lime mortar, has been used which has washed out and almost entirely disappeared. As a result, the stones are not properly bedded one on the other and numerous cracks appear.

Essentials in repointing are much the same as in any other repair job. What is required is not so much engineering as the application of good, sound common sense which in this and many other cases are the same. First, the joints must be thoroughly cleaned and loose pieces of stone removed. Second, if appearances indicate that it is desirable, an attempt should be made to grout the body of the masonry. A large joint in the top surface or surfaces should be selected or, if necessary, holes drilled, and then grout pumped into the masonry until it begins to appear on the surface. In this manner the interior joints will be filled with grout, and all stones properly embedded. In many cases where this is done, apparently, very satisfactory results have been obtained. Third, the surface joints should be thoroughly cleaned again and dug out to a depth of at least one inch. Fourth, the joints are then ready to be repointed.

In repointing, the joint surfaces should be kept moist; the mortar used should not be leaner than a ½ Portland cement-sand mortar, mixed as dry as possible. The mortar should be forced into the joints and compacted with a caulking tool, in order that a dense mortar may be obtained. The masonry surfaces should then be kept damp, so that the mortar will not dry out. Extreme care in this connection must be exercised in warm, dry weather. The horizontal joints should be finished with an undercut top edge, so that a drip ridge will be obtained, which will prevent water entering the joints. Vertical joints should be finished flush. Remember, when in doubt about repointing—to paraphrase the popular advertisement—if "you save the joint you save all."

P. G. LANG, JR.,
Engineer of Bridges, Baltimore & Ohio, Baltimore, Md.

Second Answer

As many old stone masonry piers and abutments are now carrying heavier loads than they were ever intended to carry when built, they should be kept well pointed so that any movement can be detected easily.

The precautions necessary for the best results are to see that the mortar is pushed, poked, squeezed or thrown into all openings, large or small, until all holes are filled, at least to a depth of two feet from the face of the wall. Some masons are inclined to regard their work on one of these jobs as merely that of giving the abutment or pier a "pretty face" and will overload the joint on the face of the wall. What really counts, however, is the mortar that is worked back into the wall.

I find that a slightly raked joint is more lasting than a superflushed one, as frost and vibration do not have as much effect on it. Joints near the water line and subject to wash can be filled with mortar and then calked with old rope as a protection until the cement sets. Joints under water and within reach can be helped some by packing with "cement sausage." These are made of burlap or similar material, of a size to fit the joints to be filled, and are filled with dry mortar and crowded into the joints as far as possible.

M. E. KENT,
Mason Foreman, New York, New Haven & Hartford, Westerly, R. I.

Treated or Untreated Planking for Viaducts

Where traffic on a creosoted timber highway overcrossing results in an amount of wear to the floor planks warranting the use of untreated planks, should these be made heavy enough to dispense with treated subplanking?

It is the practice on the Batimore & Ohio, Western lines, to provide only a single thickness of subplanking on highway bridges. Thus far the material used has been untreated. The experience is that the life of white oak flooring is determined both by decay and roughness on account of wear, while in the few cases where yellow pine is used, the plank wears out before it rots out, particularly in communities where the roads are used by tractors with steel lug wheels.

A. B. SCOWDEN,
Assistant Engineer Bridges, Baltimore & Ohio, Lines West, Cincinnati, Ohio.

New and Improved Devices

A New Timber Floor Construction

BUILT UP or laminated slabs of treated timber have recently been placed on the market for use in place of floor planks, particularly as the flooring for highway bridges and for the paving of railway-highway crossings. They have the same general characteristics as solid planking as far as their installation is concerned, but are said to possess a number of advantages over plank in other respects, of which the following are the most important. They present an edge grain wearing surface, are less subject to warping and, being assembled in large sections, require a smaller number of fastenings to hold them in place. Another advantage in the case of bridge floors arises from the fact that the timbers composing the slab are placed on edge. Therefore, the units may be obtained in thicknesses affording adequate strength for greater span lengths than would be practicable with solid plank.

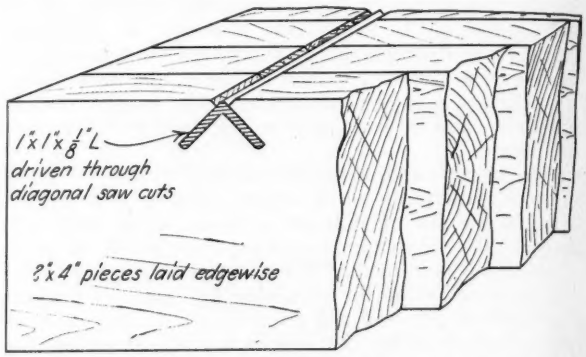
The unit slabs are made by assembling dimension

A Tym-Ber-Slab Highway Crossing

timber, 2 in. by 4 in. or 2 in. by 6 in., or other sizes, side by side to form slabs from 18 to 26 in. wide or wider if desired, and in lengths from 8 to 20 ft. The under sides of the slabs are skerfed by two diagonal saw cuts so that 1-in. by 1-in. by ⅛-in. angle bars may be driven through the laminations to hold them together, ¼-in. holes at each end of these angles being provided so that the outside pieces may be securely spiked and thus effectively anchor the angles. Further security is obtained by spiking each member to the one previously placed with 20-d spikes at 2-ft. centers.

The slabs are treated by the Bethell process with a solution consisting of at least 65 per cent of coal tar distillate oil and obtaining an absorption of at least 10-lbs. of solution per cubic foot of timber. The recommended practice in the use of this construction calls for the coating of the finish floor with hot asphaltic filler at a temperature of 200 degrees C, followed by spreading a dry sand, using approximately one cubic yard for every 100 sq. yd. of floor surface.

When used in bridge floors the units are attached to the steel stringers with hook bolts. In the case of cross-

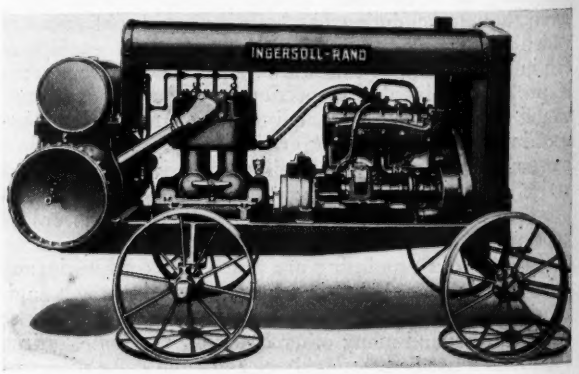


A Detail View of the Laminated Plank Construction

ing planks, the slabs are fastened with lag screws. This construction is known as Tym-Ber-Slab floor sections and is manufactured by the Columbus Creosoting Company, Indianapolis Ind.

A Small Air Compressor

THE Ingersoll-Rand Company, New York City, is now manufacturing a portable air compressor plant for a variety of work which in the past has frequently been considered too small to warrant the purchase and



The New Ingersoll-Rand Compressor.

operation of compressed air equipment. Included in work of this character is that involving the drilling of shallow rock, heretofore done usually by hand methods.

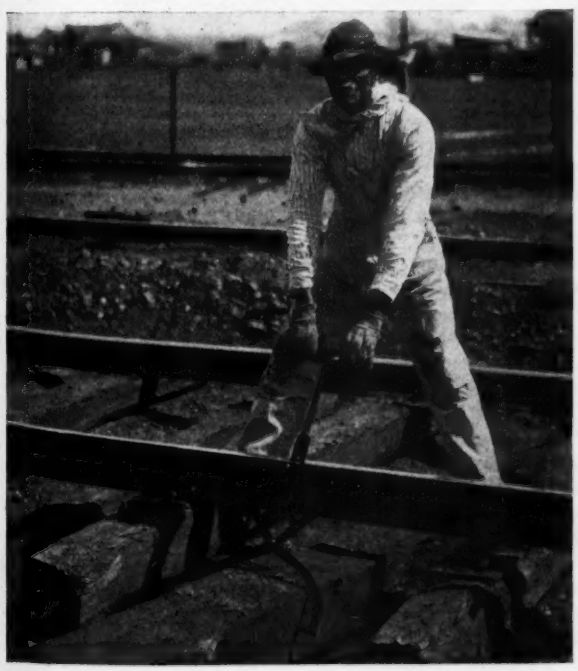
also work involving the repair or demolition of paving and the like, as well as the digging of pipe line trenches, the calking of pipe, the cleaning of walls, etc.

The new machine is designated as the 4¼ in. by 4 in. Type 20 plant, and has a piston displacement of 60 cu. ft. per min. Like the larger Ingersoll-Rand portable plants, it consists of a duplex vertical compressor, direct-connected to a four-cylinder, four cycle, tractor type gasoline engine, equipped with a circulation water cooling system for the engine and a sectionalized radiator, a fan and pump for the compressor, also with the Ingersoll-Rand compressor regulator and engine control for reducing speed during unloaded periods. The unit is supported on a one-piece cast steel frame with a sheet steel roof and removable side doors to protect the engines from tampering or from inclement weather. While the illustration shows the plant mounted on steel wheels and axles the construction is such as to permit mounting also on wooden artillery wheels with solid rubber tires, on a Ford truck or on skids for mounting in a car or truck. The compressor is also built to permit the substitution of an electric motor drive for the gasoline engine. In general service it will operate the following Ingersoll-Rand tools:

One BAR-33 "Jackhammer" rock drill,
One CC-25 paving breaker,
One 56-H clay or trench digger,
Two 22-SR backfill tampers,
Two 2-S calking or chipping hammers, or
One No. 90 riveting hammer.

New Tie Tong Proposes to Prolong Tie Life

A NUMBER of roads in the southwest have begun to use a tie tong which is indicative of the growing favor of methods that are less destructive on



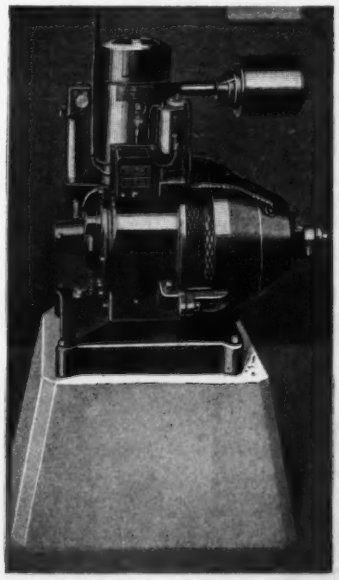
Inserting a New Tie With the Davis Tie Tong

ties than those in general use. The device resembles an ice tong but with the difference that the gripping jaws are actuated by a single handle. This handle is of a convenient length for handling by one man and is so connected to the gripping jaws as to prevent the slipping that arises where the pull is not equally divided between both jaws. The tool in question is called the Davis tie tong.

It weighs about eight pounds and is adapted not only for pulling old ties out of the ballast and inserting new ties but for pulling ties up embankments or along the shoulders. The principal advantage in its favor is the reduced amount of puncturing of ties that results from its use as distinguished from the familiar pick or spiking hammer. Since there is less likelihood of the tong losing its grip, and since, with the tool, ties can be handled readily by one man, it also constitutes a safety measure and a labor saver. The tong is a product of the Maintenance Engineering Corporation, Houston, Tex.

A Small Unit Electric Power Plant

A NEW small size electric power and light outfit has been placed on the market by the Western Electric Company which is known as the 8 D.C. It is adapted to the general usage of the small electric generator unit for supplying power and light at stations, camps and other places where electric current is not available. Characteristic of such equipment it comprises an electric generator direct connected to a single-cylinder gas-engine unit. The machine is rated at 750 watts but is said to develop more than 850 watts on the battery charging run. The gas engine is of the two-cycle type with a 2¾-in. bore and a 4-in. stroke. It is designed to run either on kerosene or gasoline and is equipped with a two-gallon fuel tank located in the base. When operating with kerosene the engine is started with gasoline by means of a small priming cup.



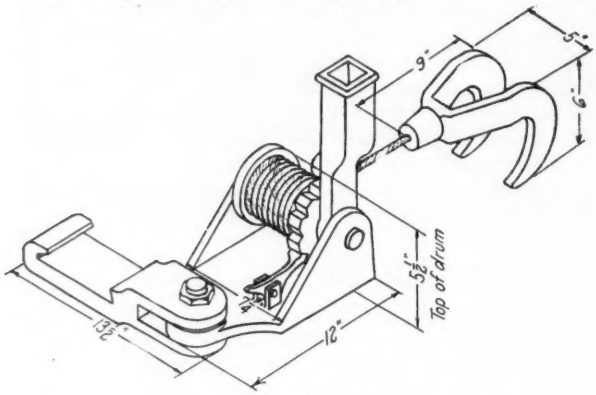
The New Gas Engine Driven Power and Light Unit

The tapering charge is controlled automatically from the beginning to the end of the charge, which protects the battery and assures long service. The oiling system of the 8-DC comprises a positive action pump which draws oil from the bottom of the crank case and forces it to the main bearing. The cylinder, crank pin bearings and all other moving parts run in a bath of oil created by a splasher.

Air cooling provides an ideal operating temperature facilitated by a new type of fan especially developed for this outfit. Speed control that increases the battery life is obtained by a centrifugal type throttling governor. A constant speed is maintained which, combined with the inherent characteristics of the generator and battery, results in a gradual reduction of current delivered to the battery. This control provides the so-called "Tapering Charge" generally accepted as a highly beneficial aid to increased battery life.

A New Way to Space Ties

TO SPACE ties without bruising or splitting when forcing them in place and to do the work cheaper than is ordinarily done is the aim of the Little Giant tie spacer, a tool which is being used on several western roads this year. This tool weighs about 60 lb. and consists essentially of three parts, a miniature windlass, a cable and a tie hook.



A Diagram of the Jack Showing the Rail Grip

The windlass is simply a small drum mounted on a malleable iron base which rests on the end of one tie, where it is held securely by means of a clamp which slips over the base of the rail. A cable 15 ft. long furnishes the means by which the tie to be respaced is drawn into position, which is done by slipping the hook over the tie in question and operating the lever on the windlass, the ratchet construction of the windlass permitting this without changing the position of the clamp on the rail. The device shown in the photograph has a special lever but this arrangement has since been changed to permit, the use of an ordinary track wrench or pinchbar for this purpose.

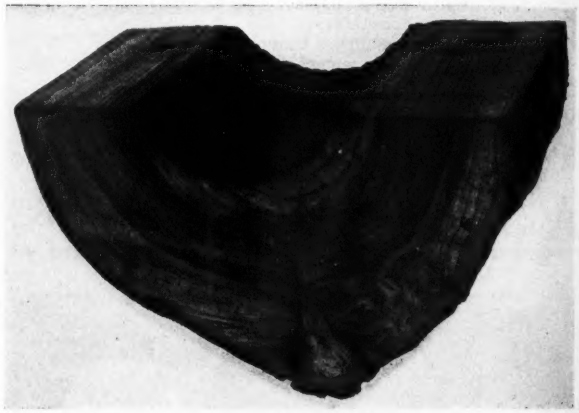
The Little Giant Tie Spacer in Place

One advantage which is claimed for this device is the reduced amount of excavation necessary with the machine to accomplish satisfactory spacing. Also, there is not the bruising and splitting of the ties that is a regular occurrence where the ties are driven into place by mauls or bars, The time saved by the machine is illustrated by an instance reported where two laborers and one machine spaced ten ties in one hour and 20 min., as compared with two hours and 20 min. required by two similar laborers to space nine ties by hand and complete the stamping. In another case, involving rock ballasted track, two track laborers spaced 15 ties in one hour as against 8 ties spaced in the same period by two laborers doing the work by hand.

This device is manufactured by the Little Giant Tie Spacer Company of Pomona, Cal.

Old Water Pipe With Long Life

THE United States Forest Products Laboratory at Madison, Wis., has acquired a half section of a piece of wooden water main, recently unearthed at Marylebone, England, where it was once in use as a portion of a water supply system at that point. While it is not known definitely when the pipe was installed it is known to have been included in one of the earliest attempts at water works development in England, when the method employed for building conduits to carry the water was to bore out logs to a diameter of 6 or 7 in. The age of the pipe is thus estimated to be between 150 and 200 years. The wood, however, which is a piece of elm, is still sound. Its condition is plainly shown in the illustration.



A Section of Wood Pipe Still Sound After 200 Years

In this instance it is undoubtedly true that the preservation of the wood against decay resulted largely from its having been buried deeply in the earth or submerged in water with no opportunity for the air necessary to decay to reach it. It is probable also that the charcoal surface of the interior of the pipe, resulting from the boring process employed in making the pipe, assisted in the preservation. While it is not to be expected that all species of wood could be preserved as successfully as this, the pipe is a forcible reminder of the possibilities in preservative work. The desirability of preservative processes, on the other hand, is indicated by the fact that one-sixth of the 22,000,000 cu. ft. of timber cut annually in this country goes to replace wood which has decayed in service.

VETERANS RETIRE.—James M. Graham, section foreman on the Atchison, Topeka & Santa Fe at Ash Fork, Ariz.; Fred Holmers, section foreman at Java, Cal.; and James D. Jones, section foreman at Maramec, Okla., are among the large number of Santa Fe veterans who have retired on pensions within the last few months.

With the Associations

American Railway Engineering Association

The work of all of the standing committees of the association is now being actively prosecuted. All of the committees have held one or more meetings and in a number of instances have called on the secretary to issue questionnaires requesting information required in the work. The June bulletin, which serves in the association's year book containing the revised list of members, roster of committees, etc., is now in the hands of the printer and will be distributed within a short time.

Maintenance of Way Club of Chicago

The Maintenance of Way Club of Chicago held its 10th meeting for the current year on Wednesday, June 18, the subject for the evening being the protection of highway grade crossings. A detailed report of this meeting appears on another page of this issue.

American Wood Preservers' Association

Through the courtesy of F. C. Shepherd, assistant chief engineer of the Boston & Maine, wood preservers made an inspection of the new tie and timber treating plant of that railroad at Nashua, N. H., on Wednesday, June 25. The party consisted of officers and committee chairmen of the Wood Preservers' Association, members of the Committee on Wood Preservation of the American Railway Engineering Association and other railway officers interested in the treatment of wood.

Metropolitan Track Supervisors' Club Holds Annual Outing

The combined annual meeting and outing of the Metropolitan Track Supervisors' Club was held at Hillburn, N. Y., on June 5, the principal feature being a talk by N. M. Rice, general purchasing agent of the New York, New Haven & Hartford who discussed the relation of the track supervisors to the purchases and stores department. The party was carried to Hillburn on a special train provided by the Erie, leaving Jersey City at 9:15 a. m. Upon arriving at Hillburn the plant of the Ramapo-Ajax Corporation was inspected after which the party was taken by automobile up the Hudson river to Bear Mountain Inn where lunch was served. Following lunch, the members were taken for about a 40-mile drive through West Point and over the Storm King highway, through Central Valley, Tuxedo Park and other picturesque places ending at Suffern whence the special train returned to New York. The officers who were elected for the ensuing year are, president, S. A. Hart, supervisor of track, Pennsylvania System, Mt. Holly, N. J., vice-president, S. J. Malloy, division engineer, Erie, Jersey City, N. J. and secretary-treasurer W. C. Kidd, Ramapo-Ajax Corporation, Hillburn, N. Y.

The Material Market

THE reduction in the tonnage of unfilled orders of the United States Steel Corporation from 4,208,447 on April 30, 1924 to 3,628,089 on May 31, is probably a fair index of the trend of the material market. This situation is being balanced, however, by a further decrease in production which now probably averages in the neighborhood of 50 to 60 per cent of capacity. While it is true that there has been a marked decrease in the business on the books of the manufacturers which forms the basis of the current rate of output and necessarily has a marked influence on their attitude towards new business and prices, it is also a fact that the consumer's stocks on hand are also decreasing as a result of the natural tendency to withhold orders just as long as possible so as to take any possible advantage of further reductions in prices. Therefore while more reductions in price have occurred in the last month, as will be noted in the table below, it is the belief that further recessions in large amounts are not expected with the possible exception of those items in which readjustment has taken place slowly.

PRICES IN CENTS PER 100 POUND

	May 20		June 20	
	Pittsburgh	Chicago	Pittsburgh	Chicago
Track spikes	$2.90 to $3.00	.... to $3.10	$2.90 to $3.00	.... to $3.10
Track bolts	3.75 to 4.25	.... to 4.10	3.75 to 4.25	.... to 4.10
Angle bars	.... to 2.75	.... to 2.75	.... to 2.75	.... to 2.75
Tie plates, steel	.... to 2.55	.... to 2.60	2.50 to 2.55	.... to 2.60
Boat spikes	3.25 to 3.40	3.59 to 3.74	3.25 to 3.40	3.59 to 3.74
Plain wire	2.65 to 2.75	2.99 to 3.09	.... to 2.65	.... to 2.99
Wire nails	2.90 to 3.00	3.24 to 3.34	2.85 to 2.90	3.19 to 3.24
Barbed wire, galv.	3.70 to 3.80	4.04 to 4.14	.... to 3.70	.... to 4.04
C. I. pipe, 6 in. to 12 in., per ton	....	.... to 55.20	....	.... to 54.70
Plates	2.20 to 2.25	.... to 2.45	2.15 to 2.20	2.30 to 2.35
Shapes	.... to 2.25	.... to 2.45	.... to 2.20	.... to 2.35
Bars, soft steel	2.20 to 2.25	.... to 2.35	.... to 2.20	2.20 to 2.25
Rivets, structural	2.65 to 2.75	.... to 2.90		
Open-hearth rail, per gross ton, f. o. b. mills				$....

After some activity early in the month, the scrap market has again resumed the state of inactivity with the effect of causing further reductions in prices although these have been rather moderate.

PRICES PER GROSS TON AT CHICAGO

	May	June
Relaying rails	$27.00 to $32.00	$27.00 to $32.00
Rails for rerolling	15.00 to 15.50	14.75 to 15.25
Rails less than 3 ft. long	17.00 to 17.50	16.00 to 16.50
Frogs and switches cut apart	14.25 to 14.75	13.50 to 14.00
Steel angle bars	15.50 to 16.00	15.00 to 15.50

The prices of lumber continue to show weakness particularly in the case of the Southern pine. With respect to the market for this material it is to be noted that the total of orders on hand with the manufacturers on June 16 was about 70 per cent of the volume of unfilled orders for the corresponding date of last year. It also represents a reduction of nearly 50 per cent from the volume of orders in the hands of the manufacturers on January 28 of the present year, although this reduction is at least in part a characteristic tendency of the lumber market during the early months of the year. On the West Coast the reduction in the volume of business has not been so large, nevertheless the tendency is sufficient to exercise a considerable influence on prices.

SOUTHERN PINE MILL PRICES

	May	June
Flooring, 1x4, B and B flat	$45.90	$40.45
Boards, 1x8, No. 1	34.60	33.90
Dimension, 2x4, 16, No. 1, common	26.65	26.00
Dimension, 2x10, 16, No. 1, common	28.55	27.45
Timbers, 4x4 to 8x8, No. 1	30.20	27.40
Timbers, 3x12 to 12x12, rough	39.35	34.40

DOUGLAS FIR MILL PRICES

Flooring, 1x4, No. 2, clear flat	32.00	35.00
Boards, 1x8, 6 to 20, No. 1, common	17.50	16.50
Dimension, 2x4, 16, No. 1, common	16.50	16.50
Dimension, 2x10, 16, No. 1, common	16.00	16.00
Timbers, 6x6 to 8x8, No. 1, common	23.00	23.00
Timbers, 10x10 to 12x12, rough	20.00	18.00

News of the Month

The Texas & Pacific has been discharged from receivership and J. L. Lancaster, one of the receivers, has been elected president.

Class I roads reported a total of 1,760,268 employees for the month of March, 1924, the last month of record, which is a decrease of 56,211, or 3.1 per cent as compared with the same month of last year. This decrease has occurred chiefly among shop employees. The total compensation in March, 1924, was 5.5 per cent less than in March, 1923.

A new record in long locomotive runs was established when four sections of the Sunset Limited and six sections of the Golden State Limited of the Southern Pacific, making 10 trains in all, left Los Angeles on May 22 and covered the distance to El Paso, 815 miles, without changing engines. No trouble was experienced on the trip and all trains arrived on time.

Extensive tests to determine the availability of radio telegraph for transmitting railroad messages other than train orders in the event of extensive damage to wires have been conducted on the Pennsylvania with the co-operation of the American Radio Relay League. The tests, which covered the principal operating points on the Pennsylvania between the Atlantic seaboard on the east and the Mississippi river on the west, proved highly successful.

Among the officers elected by the Western Society of Engineers, Chicago, for the ensuing year are: E. T. Howson, editor, *Railway Engineering and Maintenance*, who was elected president succeeding C. A. Morse, chief engineer of the Chicago, Rock Island & Pacific; F. E. Morrow, assistant chief engineer, Chicago & Western Indiana, Chicago, who was elected second vice-president, and George W. Hand, assistant to president, Chicago & North Western, who was elected treasurer.

Freight car loading continued to decline during the week ended June 7, the last week of record, when the total was 910,707 cars, which is a decrease of 101,605 cars as compared with the corresponding week of last year although an increase of 74,499 cars as compared with 1922. This loading was also lower than that for the two middle weeks of May. Loading in the southwestern district continued to be above that for the corresponding week of last year but all classes of commodities showed decreases except grain and grain products.

Of 6,290 locomotives inspected by the government during April, 3,078, or 50.5 per cent were found defective and 399 were ordered out of service, according to a report of the Interstate Commerce Commission. During the same month 89,131 freight cars were inspected with 4.7 per cent of the number found defective and 1,983 passenger cars were inspected of which one per cent were found defective. During the same month 20 cases involving 45 violations of the safety appliance act were submitted to various United States attorneys for prosecution.

In accordance with the suggestion made by the Supreme court in its decision denying the St. Louis Southwestern its petition to compel the Interstate Commerce Commission to permit the carriers to inspect its valuation records, the commission has now issued a modified order permitting access to some of the data under certain conditions. The commission's ruling states that upon application in writing, requesting data specifically pertaining to items specifically protested, a carrier may, as soon as practicable after the application, examine such parts of the data above described as pertain to matters specifically protested.

The Pennsylvania has figured that it cost $54,330 to keep its tracks in Northern Michigan clear of snow last winter. Snow plows traveled back and forth over the main line and branches between Grand Rapids, Mich., and Mackinaw City, for a total distance of 9,468 miles, while this work was supplemented by the use of flangers on engine pilots over an additional distance of 4,620 miles, making a total distance of over 14,000 miles covered by snow plows and flangers. In connection with this work, about 500 extra snow shovelers were employed.

A total of 46 roads have made payments to the government amounting to $4,170,192 as one-half of the excess earnings over the return allowable under the Transportation Act, according to the report made by Commissioner Lewis of the Interstate Commerce Commission to the Congressional Committee on Appropriations. Included in this number are four Class I roads, the Bessemer & Lake Erie, the Duluth, Missabe & Northern, the Elgin, Joliet & Eastern and the Richmond, Fredericksburg & Potomac. At the present time payments are reported to be coming in day by day from railroads which have earned more than the "fair return" established by the Transportation Act, the rough estimate of the commissioners being that one-half of the excess earnings amount to $69,068,000, including $36,000,000 for 1923.

The creation of a transportation bureau was recommended to Congress on June 3 in the report of the Joint Committee on Reorganization of the Executive Departments which is to be considered at the next session of Congress. The recommendation provides for the control and direction of the bureau by a director to be appointed by the president with a salary of $7,500 a year and also for an assistant director at a salary of $6,000 a year. It will be the province and duty of the bureau, under the general direction of the Secretary of Commerce, to make investigations into all matters affecting the facilities of the United States for interstate transportation by rail, highway, water and air, and to gather such information and data as will enable the president to make recommendations to Congress looking to development and improvement in the transportation facilities of the country.

The total fuel consumption of Class I railroads during 1923 including fuel oil and coal, amounted to an equivalent of 146,500,000 tons, divided as follows: freight service, 90,000,000 tons; passenger service, 32,000,000 tons, and switching service, 24,500,000 tons. This fuel cost a total of $507,000,000, or at the rate of $3.46 per ton. During 1923 it took 160.2 lb. of coal to move one ton of gross freight 1,000 miles, or 1,000 tons gross one mile, which is 2.8 lb. less than the requirements in 1922, and 1.8 lb less than in 1921. It was brought out at the sixteenth annual meeting of the International Fuel Association that, by reducing the fuel consumption by one pound of coal for each 1,000 ton miles of freight would bring about a total saving of 561,987 tons or $1,944,000 over the cost of 1923, while a similar reduction in the coal as applied to passenger service would save 200,000 tons of coal, or $692,000. It is estimated that $29,000,000 tons of fuel are consumed while steam locomotives are standing in yards or roundhouses waiting to be put to work.

Labor News

The maintenance of way employees of the Gulf, Mobile & Northern and the Seaboard Air Line were granted increases effective April 1 and May 1, respectively, ranging from two cents an hour to $11 a month. On the Gulf, Mobile & Northern these increases will be operative until January 1, 1924, and are as follows: Bridge and building foremen, $5 a month; assistants, $3.40; extra gang foremen, $10; assistants, $10; line section foremen $5; yard section foremen, $5 and $10; pumpers, $2.50; bridge carpenters, 2 cents an hour.

On the Seaboard Air Line increases are effective until May 1, 1925, and are as follows: Bridge and building foremen, $7.50 a month; extra gang foremen, $11; section and yard foremen, $7.50; assistants, $7.50; assistant bridge and building foremen, $7.50; paint and mason foremen, $7.50; coal elevator operators and foremen at outlying points, $5.

Decisions of the Labor Board

The following recent decisions of the labor board concern employees of the maintenance of way department.

Bridge Foreman Refuses to Do Water Service Work

On October 31, 1922, a bridge and building foreman on the Great Northern received a telegram from the master carpenter requiring him to go with six men to North Bend, Minn., to make repairs to a water main under a tank, whereupon the foreman sent a telegram in reply refusing to obey instructions on the grounds that the work to be done was water service work. The next morning this foreman was asked by the master carpenter in person to do this work and again refused, the result being that the foreman was discharged from the service. The decision of the board is that the discipline is justified in this case, but in view of the length of the service of the foreman, 29 years, it was recommended that he be considered for reinstatement with seniority rights unimpaired but without pay for the time lost. (Decision No. 2317.)

Principal Work Fixes Pay

The provision in Section P of Article 5 of the national agreement of the United Brotherhood of Maintenance of Way Employees and Railway Shop Laborers that 'an employee working on more than one class of work on any day will be allowed the rate applicable to the character of work preponderating for the day" received its most recent application in a dispute coming before the Railroad Labor Board over the classification of two men employed at Iroquois, S. D., in the dual capacity of pumper and coal puller. During the period of federal control these employees were compensated at the rate applicable to coal pullers, while effective March 1, 1920, the rate has been that applicable to pumpers. A claim was made by the employees for coal puller's rates from March 1, 1920, and continuing as long as these men are assigned to the dual service, the pumper's rate of pay being less than that of coal puller. In support of the employees' position the last paragraph of Section P of Article 5 of the national agreement of Maintenance of Way Employees and Railway Shop Laborers was advanced, which provides that the rule under which workmen engaged in double duties are to be payed in accordance with the rate of the class of work which predominates, does not permit using regularly assigned employees at the lower rate of pay for less than half of a work day period in order to avoid payment of high rate. The railroad contended that the preponderant duties of these employees are those of pumpers and that they should be paid as such since the national agreement took effect. The Railroad Labor Board decided upon the evidence submitted that the employees in question are performing composite service as provided for in the section of the national agreement quoted and that the rate of pumpers is properly applicable, further that the provisions of its decision No. 2 with reference to payment under the United States Railroad Administration have not been violated. (Decision No. 2451.)

Personal Mention

Engineering

C. W. Richey, division engineer on the Conemaugh division of the Pennsylvania, with headquarters at Pittsburgh, Pa., has been transferred to the general manager's office at Pittsburgh.

J. W. Orrock, principal assistant engineer of the Canadian Pacific, with headquarters at Montreal, Que., has been promoted to engineer of buildings, with the same headquarters, succeeding C. H. Mapes, who has resigned to engage in other business.

Frank A. Merrill, engineer maintenance of way of the Boston & Maine, has been promoted to chief engineer, succeeding Arthur B. Corthell, whose death is noted elsewhere in this issue. Mr. Merrill will retain his former duties as engineer maintenance of way.

R. C. White, general superintendent of the Eastern district of the Missouri Pacific, with headquarters at St. Louis, Mo., has been promoted to engineer maintenance of way, with the same headquarters, a newly created position. Mr. White was born February 8, 1881, at Bertrand, Mo. After graduating from Missouri University and the United States Military Academy at West Point, N. Y., he entered railway service in May, 1905, as an assistant in the engineering department of the Missouri Pacific. He was made assistant engineer in maintenance in 1907, and held this position until 1909, when he was promoted to roadmaster. He was advanced to division engineer in 1910 and in 1913 was promoted to assistant engineer in charge of special work. He became district engineer in 1914 and continued in this capacity until 1917, when he was promoted to division superintendent. He was promoted to assistant chief engineer in 1919 and two years later was promoted to general superintendent of the Eastern district. He continued in this division until his recent promotion to engineer maintenance of way.

R. C. White

A. O. Cunningham, consulting engineer of the Wabash, with headquarters at St. Louis, Mo., has resigned to engage in private practice as a consulting engineer. Mr. Cunningham was born on July 8, 1866, in British Burmah. He entered the service of the Northern Pacific in 1886 being employed as a rodman and leveler. Later he was engaged in land surveying in North Dakota until 1891, when he entered the University of Minnesota. Graduating in engineering in 1894, he became a draftsman for the Gillette-Herzog Manufacturing Company, with which he had previously been employed while attending college. From 1896 to 1898 he was engaged in general contracting and engineering as southern agent of the Schultz Bridge & Iron Co., Pittsburgh, Pa., and from 1898 to 1899 served with the Pittsburgh Reduction Company as a designer of improvements in old industrial buildings at Niagara Falls and elsewhere. He was engaged in general consulting and civil engineering practice from 1899 to 1900 as a member of the Pennsylvania Engineering Company, Pittsburgh, Pa., following which he was contracting manager of the American Bridge Company at Cleveland, in charge of estimates, designs and bids, until 1902 when he became bridge engineer of the Wabash. He was promoted to chief engineer on September

1, 1905, and continued in that capacity until October, 1923, when he was appointed consulting engineer.

E. H. McGovern, engineer maintenance of way of the Cairo division of the Cleveland, Cincinnati, Chicago & St. Louis, with headquarters at Mt. Carmel, Ill., has been transferred to the St. Louis division, with headquarters at Mattoon, Ill., succeeding **A. F. Maischaider,** who had been promoted to the newly created position of engineering assistant to the general manager at Cincinnati. **C. F. Hinchman,** engineer maintenance of way of the Indianapolis terminal and Springfield division, with headquarters at Indianapolis, Ind., has been transferred to the Cairo division, succeeding Mr. McGovern. **W. B. Hodge** has been appointed engineer maintenance of way of the Indianapolis terminal and Springfield division, succeeding Mr. Hinchman. **H. C. Lorenz** has been appointed office engineer, with headquarters at Cincinnati, Ohio, succeeding **B. S. Dickerson,** promoted. Mr. Maischaider was born on October 1, 1882, at Chicago, and graduated from Purdue university in 1902. He entered railway service in June, 1902, in the engineering department of the Cleveland, Cincinnati, Chicago & St. Louis, where he served in various subordinate engineering capacities until 1912, when he was promoted to engneer maintenance of way of the Michigan division. He was appointed engineer maintenance of way of the Cairo division on April 1, 1915, and March 1, 1917, became engineer maintenance of way of the St. Louis division, with headquarters at Mattoon, Ill. He was serving as engineer maintenance of way at Mattoon, at the time of his recent promotion to engineering assistant general manager.

Track

John Nestor, roadmaster on the Northern Pacific with headquarters at East Grand Forks, N. D., has been transferred to the Minnesota division to succeed J. E. Hoving, deceased.

William F. Sullivan, section foreman on the New York, New Haven & Hartford, with headquarters at Shelton, Conn., has been promoted to assistant supervisor, with headquarters at Providence, R. I.

J. L. Huston has been promoted to roadmaster of the Indio district of the Los Angeles division of the Southern Pacific with headquarters at Niland, Cal., to succeed D. F. Bidwell, who has been assigned to other duties.

W. M. McCoy, track foreman on the Pennsylvania, Southwestern region, has been promoted to supervisor of track of the Indianapolis division, with headquarters at Spencer, Ind., to succeed **Thomas Antibus,** retired on pension.

Frank Rex, whose promotion to supervisor of track on the Allegheny division of the Pennsylvania, with headquarters at Dunkirk, N. Y., was reported in the June issue, was born on December 5, 1890, at Crestline, Ohio, and graduated from the Carnegie Institute of Technology in 1912. He entered railway service in June, 1912, as an assistant on the engineering corps of the Eastern division of the Pennsylvania. He was assistant in the valuation department from November, 1915, to July, 1916, and pilot engineer in the valuation department from July, 1916, until May, 1921, when he returned to the Eastern division as an assistant on the engineering corps. He was promoted to assistant supervisor on the Pittsburgh division in May, 1923, and was serving in this capacity at the time of his recent promotion to supervisor on the Allegheny division.

William McDiarmid, whose promotion to roadmaster on the Minneapolis, St. Paul & Sault Ste. Marie was reported in the June issue was born on September 9, 1887, at St. Paul, Minn. He entered railway service in 1906 as a chainman on the Northern Pacific and served consecutively as chainman, rodman and instrument man until 1911 when he was appointed assistant engineer. In 1912 he entered the track department as track inspector and was promoted to roadmaster in 1912. In 1919 he left the Northern Pacific to become roadmaster on the Great Northern and served in this capacity until 1921 when he was appointed yard foreman. A little later he became extra gang foreman on the Soo Lines and continued in the employ of this company as extra gang foreman and as yard foreman until his recent advancement to roadmaster at Manistique, Mich.

M. E. Davis, whose promotion to track supervisor on the Illinois Central was reported in the June issue was born October 11, 1888, at Winchester, Ind., and was graduated from the Purdue University in 1912. He entered railway service in June, 1912, as a chainman on construction on the Illinois Central at Batesville, Miss., and has continued in the service of the Illinois Central since that time, serving as a rodman on maintenance at Clinton, Ill., from December, 1912, to February, 1914, as a masonry inspector on track elevation work at Memphis, Tenn., from February, 1914, to May, 1914, as an instrument man on location and construction at Clinton, Ky., and Memphis, Tenn., from May, 1914, to February, 1915, as a building inspector from January, 1916, to October, 1917, and as an assistant engineer of the maintenance of way department from October, 1917, up to the time of his recent promotion to track supervisor, except for the period from April, 1918, to August, 1919, when he was engaged in military service.

Bridge and Building

Thomas Thygeson, bridge and building foreman on the Great Northern, has been promoted to master carpenter of the Dakota division, with headquarters at Grand Forks, N. D., to succeed **Edward McNulty,** who has been assigned to other duties.

M. Youngblood, bridge foreman on the Illinois Central, has been promoted to supervisor of bridges and buildings on the Vicksburg division of the Yazoo & Mississippi Valley, to succeed **W. Schropshire,** who has been transferred to the New Orleans division, with headquarters at Vicksburg, to succeed **H. D. Holdridge,** who has been retired on pension.

Henry Bly, whose promotion to master carpenter of the Willmar division of the Great Northern was reported in the June issue, was born on July 2, 1877, in Norway and entered railway service on October 28, 1902, as an employee in the track department of the Great Northern. He entered the bridge and building department on February 10, 1903, as a carpenter helper and was promoted to carpenter on April 1, 1904. He was advanced to carpenter foreman on August 11, 1908, and was serving in this capacity at the time of his promotion to master carpenter.

David L. McKee, supervisor of bridges and buildings on the Pittsburgh & Lake Erie at Coraopolis, Pa., has been retired on a pension after serving continuously with that company since the first day of its operation on March 1, 1879. Mr. McKee was born in 1854 and prior to entering the service of the company was employed by the builders of the road. After that time he served in various capacities until September 16, 1915, when he was promoted to supervisor of bridges and buildings. Mr. McKee's retirement was made the occasion of a meeting attended by A. R. Raymer, chief engineer.

Purchases and Stores

F. J. Berck, general purchasing agent of the Chicago & North Western, with headquarters at Chicago, has been appointed also general purchasing agent of the Chicago, St. Paul, Minneapolis & Omaha, with the same headquarters, a newly created position.

G. A. J. Carr, assistant district storekeeper on the Chicago, Milwaukee & St. Paul, with headquarters at Minneapolis, Minn., has been promoted to district storekeeper, with headquarters at Deer Lodge, Mont., succeeding **J. V. Miller,** who has resigned. **H. R. Toohey,** chief clerk to the general storekeeper, at Milwaukee, Wis., has been promoted to assistant district storekeeper at Minneapolis, Minn., succeeding Mr. Carr. **George Sheridan** has been appointed division storekeeper, with headquarters at Mobridge, S. D., succeeding **D. H. Phebus,** promoted.

Obituary

J. E. Hoving, roadmaster on the Minnesota division of Northern Pacific with headquarters at Minneapolis, Minn., died after a long record of service with this company.

J. H. Clemmitt, purchasing agent of the Norfolk & Western, with headquarters at Roanoke, Va., died on May 23. Mr. Clemmitt was born on November 20, 1881, at Richmond, Va., and entered railway service on October 16, 1896, with the Norfolk & Western, his entire service having been with that road.

Arthur B. Corthell, chief engineer of the Boston & Maine, with headquarters at Boston, Mass., died on May 24, at the age of 64. He was born on July 3, 1860, at Whitman, Mass., and was graduated from Brown University, Providence, R. I., in 1881. He entered railway service in September of that year as assistant engineer of the New York, West Shore & Buffalo (now the West Shore), and in December, 1883, was appointed supervisor, remaining in that capacity for a few months, when he was appointed division engineer. For two years he was civil engineer for the Knickerbocker Ice Company at New York and in April, 1886, returned to the New York, West Shore & Buffalo as draftsman, remaining in that capacity until September of the same year when he entered the service of the Fitzgerald & Mallory Construction Co., as assistant engineer. In July, 1887, he was appointed first assistant engineer on the construction of the Sioux City bridge over the Missouri river and in March of the following year he was appointed assistant engineer on the construction of the Thames river bridge. He was appointed assistant engineer of the New Providence & Boston (now New York, New Haven & Hartford), in September, 1889, and in March, 1892, was appointed first assistant engineer on the Providence passenger station and approaches. In January, 1897, he was appointed principal assistant engineer on construction of the South Station for the Boston Terminal Company at Boston, Mass., and in December, 1899, he went with Westinghouse Church, Kerr & Co., Boston. In February, 1900, Mr. Corthell was appointed resident engineer of the Boston Terminal Company and in February, 1902, he was appointed terminal engineer of the New York Central & Hudson River (now New York Central), at New York. He was appointed assistant executive of the Grand Central Station architects at New York in May, 1906, and in November, 1908, became secretary and consulting engineer of the Auxiliary Facilities committee of the Grand Central Terminal. In July, 1911, he was appointed chief engineer of the Boston & Maine, the position he was holding at the time of his death.

A recent computation of the effect of bad water on train operation has been made which shows that if a locomotive with a clean boiler is capable of hauling its load on level tracks at a speed of 35 miles per hour, the accumulation on the flues of a ⅛ inch thickness of hard scale, providing no change is made in the method of firing, will reduce the available speed of the engine to 28.6 miles per hour. This is the finding of P. M. La Bach, engineer, water service, Chicago, Rock Island & Pacific.

An Indication of the Value of Timber Treatment

In order to ascertain the relative durability of several species of cross ties untreated and treated by the standard processes, the Chicago North Western installed test tracks on eight divisions of its line in five different states in 1914. In these tracks 5,585 untreated and 16,863 treated ties were placed. Each section consists of approximately 2,800 ties, including 100 ties of each species of wood, divided equally between untreated and those treated by the Card (creosote and zinc chloride), Burnet (zinc chloride) and the straight creosoting process. These ties included red oak, yellow birch, lobolly pine, long leaf pine, tamarack, hard maple and hemlock. At the last inspection of these sections in November, 1923, it was found that all but 5.5 per cent of the untreated ties had been removed and the remainder will come out during this year. On the other hand, only 7.2 per cent of the 5,584 treated with zinc chloride, 4.9 per cent of the 5,570 treated with the Card process and 1.5 per cent of the 5,709 treated with creosote had been removed. Based on these records the untreated ties showed an average life untreated of 4.14 years for yellow birch to 5.99 years for long leaf pine, while it is estimated that the treated ties will last from 12 to 20 years.

Construction News

The Atchison, Topeka & Santa Fe has awarded a contract to George P. Nichols & Bro., Chicago, for the construction of a 120-ft. transfer table of 427 tons capacity, at San Bernadino, Cal. This company contemplates the construction of an under pass to eliminate the grade crossing at the intersection of its tracks at Second avenue, in Dallas, Tex.

The Atlantic Coast Line has awarded a contract to the Roberts & Schaefer Company, Chicago, for the construction of a 500-ton capacity, two-track, reinforced concrete electric locomotive coaling and sanding plant at Jacksonville, Fla.

The Canadian Pacific has awarded a contract to Rosen & Wickstrand, Regina, Sask., for the grading of the new line from Leader, Sask., to a point 25 miles east.

The Central of Georgia has awarded the following contracts for work in connection with extensive line and grade revision work which it is undertaking on its Columbus divison: To the Brooks-Callaway Company, Atlanta, Ga., $1,440,000; the Luck Company, Asheville, N. C., $275,000; to the O'Brien Construction Company, Inc., Birmingham, Ala., $305,000; to the Hardaway Contracting Company, Columbus, Ga., $158,000; to J. A. Kreis, Knoxville, Tenn., $780,000; and to the Nichols Contracting Company, Atlanta, Ga., $205,000.

The Chicago & Alton is preparing plans for the construction of division terminal yards at Louisiana, Mo. This company has been ordered by the Missouri Public Service Commission to construct a double-track subway under Eighteenth street in Kansas City, Mo., at a cost of $50,000.

The Chicago & North Western will begin at once the construction of a bridge over its tracks at Folsom Place in Milwaukee, Wis., to abolish the grade crossing at that point.

The Chicago, Burlington & Quincy awarded a contract to the Graver Corporation, East Chicago, Ind., for the construction of water treating plants at Hannibal, Mo., and Old Monroe, reported in the May issue. This company has awarded a contract to G. A. Johnson & Son, Chicago, for the construction of a new passenger station at Shenandoah, Ia., reported in the June issue.

The Chicago, North Shore & Milwaukee, electric, will construct a one-story brick motor bus garage, 80 by 200 ft. at Waukegan, Ill.

The Chicago, Rock Island & Pacific has completed surveys for the construction of a 3½-mile spur at Keosauqua, Ia.

The Cleveland, Cincinnati, Chicago & St. Louis, jointly with the New York, Chicago & St. Louis, is making preliminary studies for the elevation of their adjoining tracks from East Market street to Massachusetts avenue, in Indianapolis, Ind., a distance of approximately one-half mile. Four subways will be constructed, and the entire project is estimated to cost $750,000.

The Cleveland Union Terminal is calling for bids for the construction of a retaining wall along Ontario street south of the Public Square in Cleveland, Ohio, and for excavation in connection with the new Union Station. The retaining wall contract calls for approximately 225,000 yards of excavation; about 240,000 lbs. of steel sheet piling; the placing of some 6,000 yards of concrete and about 800,000 lbs. of reinforcement bars. The wall will be approximately 500 feet long and 20 to 40 feet in height.

The Delaware, Lackawanna & Western has awarded a contract to W. H. Gahagan, Inc., Brooklyn, N. Y., for grading in connection with the construction of a classification yard at Binghamton, N. Y. The approximate cost will be $200,000. To the John F. Dolan Contracting Company, New York, a contract has been awarded for grading in connection with a grade crossing elimination project at Analomink, Pa.; probable expenditure, $50,000.

The Detroit, Toledo & Ironton is reported to be planning the construction of car shops at Springfield, Ohio, at an estimated cost of $500,000.

The Erie has received bids for the construction of two bridges carrying its tracks over highways at Jamestown, N. Y., eliminating crossings at grade. The company expects to ask for bids in the near future, on its track elevation project at Paterson, N. J.

The Grand Trunk Western has awarded a contract to Bierd, Lydon & Grandpre, Inc., Chicago, for the construction of the engine terminal at Battle Creek, Mich., reported in the Railway Age of May 17.

The Great Northern plans the construction of an enginehouse with repair facilities at Williston, N. D., at an estimated cost of $35,000.

The Illinois Central plans the construction of a second track on the St. Louis division between Layfield, Ill., and Wilderman, a distance of approximately 20 miles. The construction of a cut-off line from New Athens, Ill., to East St. Louis, is also contemplated. This company will soon call for bids for the construction of five subways under its tracks at Jackson, Miss. This work, which is part of a track elevation project at Jackson, will cost approximately $1,250,000. Plans for the subways are now being prepared. This company has awarded a contract to the W. J. Zitterell Company, Webster City, Ia., for the construction of a new passenger station, five concrete viaducts and an overhead bridge at Paxton, Ill. The project is estimated to cost $200,000.

This company has prepared plans for the construction of a subway for pedestrians under Michigan avenue at Van Buren street in Chicago. The subway will be 18 ft. wide.

The Indianapolis Union is making preliminary studies for the elevation of its tracks in Indianapolis, Ind., from Prospect street to West Eighteenth street, a project involving the elevation of approximately five miles of four-track and two and one-half miles of double track line. The construction will include 30 subways, with connecting retaining walls, in addition to undergrade construction for seven intersecting railroad lines. The plans include the construction of a reinforced concrete arch bridge across the White river. The entire project is estimated to cost $10,000,000.

Los Angeles County has applied for permission to construct a railroad approximately 10 miles long from Azusa, Cal., to the San Gabriel canyon. The line is to be used for the transportation of materials for a dam in the canyon.

The New York Central has reached an agreement with the city of Toledo, O., under which it will pay 65 per cent of the cost of constructing a subway under its tracks at Detroit avenue in Toledo. The total cost of the improvement is estimated at $400,000.

The Northern Pacific is reported to be planning the construction of a branch line from McCleary, Wash., to Shelton.

The Pennsylvania jointly with the Cincinnati, Indianapolis & Western, is making preliminary studies for the elevaton of the adjoining tracks of the two companies in Indianapolis, Ind., from Davidson street to State street, a distance of approximately three-quarters of a mile. The project includes the construction of five subways with connecting retaining walls, at an estimated cost of $1,500,000. This company has awarded a contract to the Keystone State Construction Company, Philadelphia, for the construction of a highway bridge over its tracks at Edgemoor, Del., to cost approximately $200,000. A contract has been awarded to the McClintic-Marshall Company for the construction of a bridge, to cost approximately $500,000, in connection with track elevation work at Cleveland, Ohio.

A contract has been awarded to the H. W. Kellogg Company, New York, for the construction of a 175-foot brick chimney at the company's new power house at Juniata, Pa., to cost approximately $11,000. This company has awarded a contract to the James McGraw Company, Philadelphia, Pa., for the construction of three over-head bridges at Renovo, Pa., Irvineton and Youngsville, respectively, at an approximate cost of $190,000. These bridges are being constructed in connection with the elimination of grade crossings.

The Reading has awarded contracts to Martin & Breefi, Inc., Philadelphia, for the substructure and to the McClintic-Marshall Company, Philadelphia, for the superstructure required for the reconstruction of a bridge over Crum creek, south of Darby creek, on its Chester branch. This company has also awarded contracts to the Folwell-Ahlskog Company, Chicago, for the substructure and to the American Bridge Company, Philadelphia, Pa., for the superstructure and to the Minwax Company, Inc., New York, for the waterproofing required for the reconstruction of a bridge over the Schuylkill river, north of Birdsboro, Pa. This company has awarded contracts to O'Rourke Bros., Norristown, Pa., for the substructure and to the Johns-Manville, Incorporated, Philadelphia, Pa., for the waterproofing for a bridge on the line of a State Highway, west of Wyomissing, Pa., on its Lebanon Valley branch.

The Seaboard Air Line is constructing a modern brick freight station in the business district of Orlando, Fla. C. V. York, Raleigh, N. C., has a contract for the major part of the work in connection with the improvement.

The Southern Pacific will soon begin the construction of a 9-mile belt line at Dallas, Tex.

This company has announced that if plans for the consolidation of the Southern Pacific and the El Paso & Southwestern are approved, a main line will be built through the city of Phoenix, Ariz., also a line extending from Red Rock, Ariz., to a connection with the Phoenix & Eastern at Magma Junction or Florence, and a line from Hassayampa to a connection with the main line of the Southern Pacific at some point between Colfred, Ariz., and Indio, Cal. The lines of the Phoenix & Eastern and the Arizona Eastern are to be reconstructed to conform with main line standards. This construction is to be completed within two years after the consolidation with the El Paso & Southwestern. The total amount of new construction will be between 110 and 150 miles of line.

The St. Louis-San Francisco contemplates the construction of a combined passenger station and office building at Tulsa, Okla. This company has prepared plans for the construction of a passenger station and office building in Oklahoma City, Okla., to cost approximately $1,000,000.

The Temiskaming & Northern Ontario has awarded a contract to Stuart & Sinclair, Hamilton, Ont., for the construction of an enginehouse at North Bay, Ont., estimated to cost $75,000.

The Terminal Railroad Association of St. Louis is constructing a two-story service building, 49 by 81 ft., in St. Louis, Mo., with company forces. The building will be of brick and concrete construction and will cost approximately $30,000.

The Texas and Pacific is reported planning the construction of a yard and roundhouse at Shreveport, La., at an estimated cost of $1,000,000.

The Union Pacific has awarded a contract to the Utah Construction Company, San Francisco, Cal., for the construction of a cut-off line, 100 miles long, from Rogerson, Idaho, to Wells, Nev., the cost of which is estimated at $3,500,000.

The Vicksburg, Shreveport & Pacific plans the construction of a freight and passenger station at Monroe, La.

The Western Pacific is reported to have awarded a contract to W. A. Betchel, San Francisco, Cal., for the construction of a roundhouse, car repair shop and storehouse at Stockton, Cal.

The Yosemite Valley is calling for bids for the relocation of its line from Merced Falls, Cal., to Detwiler, a distance of 17 miles. The project is estimated to cost $5,000,000.

Equipment and Supplies

The Atchison, Topeka & Santa Fe has inquired for 4,500 tons of structural steel for use at San Bernardino, Cal.

The Michigan Central has inquired for 850 tons of structural steel for use at Detroit, Mich.

The New York Central has received bids on 1,300 tons of bridge steel.

The Southern has inquired for 5,000 tons of structural steel for a bridge at Burnside, Ky.

Supply Trade News

General

The Link Belt Company, Chicago, is preparing plans for a two-story factory branch, 60 by 100 ft., at Detroit, Mich.

The Ramsey Chain Company, Inc., Albany, N. Y., has appointed the **Morse Engineering Company,** 549 West Washington street, Chicago, as its Chicago representative. The president of this company is T. A. Morse.

The Industrial Works, Bay City, Mich., has appointed Ridenour, Seaver & Kendig, 773 Ellicott Square, Buffalo, N. Y., as representative in the Buffalo district, with **L. N. Ridenour,** resident manager.

The Northwest Engineering Company, Chicago, manufacturers of power shovels, drag lines and cranes, has opened an office at Atlanta, Ga. **M. B. Ogden,** district manager of the Austin Machinery Company, Atlanta, Ga., has been appointed southeastern district sales manager, with headquarters at Atlanta, Ga.

J. C. Merwin, works manager of the Chain Belt Company, Milwaukee, Wis., has been elected second vice-president, with headquarters at Milwaukee; **Brinton Welser,** assistant secretary, has been promoted to secretary, and **C. E. Stone,** assistant to the president and purchasing agent, has been promoted to assistant secretary. **C. R. Messinger,** president, **Clifford F. Messinger,** first vice-president, and **C. L. Pfeifer,** treasurer, were re-elected. Mr. Merwin, who graduated from Sheffield Scientific School, Yale University, in 1910, has been associated with the company since 1917. Mr. Welser graduated from the University of Wisconsin in 1912 and has been with the Chain Belt Company in various capacities since then. Mr. Stone graduated from the University of Michigan in 1910 and has been purchasing agent of the company since 1918.

Sullivan, Kipp & Chace, Ltd., consulting engineers and constructors, has been organized at Winnipeg, Man., to advise in problems of grade revision, tunnelling, electrification, water supply, power supply, terminal and port developments and elevator building, with **J. G. Sullivan** as president, **Theodore Kipp** as vice-president, **W. G. Chace** as treasurer and **C. A. Monkman** as secretary. Mr. Sullivan is a graduate of Cornell University and was connected with the location of the Butte, Anaconda & Pacific. From 1905 to 1907 he was assistant to the chief engineer of the Panama canal, in which capacity he laid out the railway system on the Isthmus. From 1907 to 1919 he was manager of construction, assistant chief engineer and chief engineer, consecutively, of the Canadian Pacific and is now president of the Canadian Engineering & Construction Company, Ltd. In 1922 he was elected president of the Engineering Institute of Canada. He is also a past president of the American Railway Engineering Association. Mr. Kipp was born in 1880, at Peoria, Ill., was educated at Bradley Polytechnic Institute, and served his apprenticeship in various industries, particularly milling and distilling, with a view to becoming an expert in the recovery of industrial by-products. Since 1906 he has been engaged chiefly in consulting and supervisory capacities in various industrial plants. In 1913 he engaged in the engineering and machinery business in Winnipeg, now known as the Kipp-Kelly, Ltd. Mr. Chace graduated from the University of Toronto, served as resident engineer on a small hydro-electric development in Niagara Falls and later studied railway electrification for the Temiskaming & Northern Ontario Railway Commission. While a partner in the consulting firm of Smith-Kerry & Chace of Toronto he had charge of the design and construction of a 100,000-hp. municipal hydro-electric power development on the Winnipeg river. Later he was chief engineer for the greater Winnipeg water district at Winnipeg, Man. Mr. Monkman was born at Winnipeg and from 1898 to 1908 was a member of the construction organization of the Canadian Pacific in responsible charge of accounts and purchases, reporting to the chief engineer and vice-president. Since resigning from that position he has been in charge of the merchandising of steel and steel products in Western Canada for the Canadian Steel & Wire Company, the United States Steel Products Company, Drummond, McCall & Company, and the Algoma Steel Corporation. From 1916 to 1918 he was a member of the staff of the Manitoba Bridge & Iron Works, and from then until 1922 was manager of the Manitoba Steel & Iron Company, Ltd. Since 1922 he has been supervisor of erection of a 51-mile transmission line and of other construction work.

Personal

H. D. Webb has been appointed St. Louis representative for the Maintenance Engineering Corporation, Houston, Tex., manufacturer of the Davis tie tong.

C. K. Wehn, who is in charge of sales of Blaw-Knox steel buildings in the Pittsburgh district, has had his jurisdiction enlarged to include the office of assistant sales manager of the standard building department.

K. E. Kellenberger, signal editor of the Railway Age and editor of Railway Signaling, publications associated with *Railway Engineering and Maintenance,* has been appointed eastern manager of the **National Safety Appliance Company,** with headquarters at 608 Railway Exchange building, Chicago.

Herman Lemp, engineer in charge of the internal combustion engine engineering department of the **General Electric Company,** at Erie, Pa., has resigned to join the **Erie Steam Shovel Company.**

K. A. Hills, representative of the General Electric Company at Davenport, Ia., has been promoted to manager, with the same headquarters. **S. E. Gates,** manager of the Spokane, Wash., office, has been transferred to Los Angeles, Cal., and will be succeeded by **Bernhard Olsen.**

C. D. Price, who for many years has been connected with the **Industrial Works,** Bay City, Mich., recently as traveling service engineer, has been appointed district sales manager of the St. Louis district, with headquarters at the Railway Exchange building, St. Louis, Mo.

J. W. Fogg, manager of railroad sales of the **American Bolt Corporation,** with headquarters at Chicago, has been promoted to assistant to the vice-president and general manager, with the same headquarters. Mr. Fogg was born in England and moved to Canada when a small boy. He entered railway service with the Grand Trunk and in 1885 came to the United States and served as a locomotive engineer on the Wisconsin Central and later on the Chicago Terminal Transfer, which was taken over by the Baltimore & Ohio. Later he became traveling engineer of the Chicago Terminal Transfer and in 1901 was made master mechanic. In 1915 he left the employ of the Baltimore & Ohio to become sales representative of the Boss Nut Company, which position he held until 1919. In the latter year he was promoted to manager of railroad sales, which position he has held until his recent promotion.

J. W. Fogg

John Emory Meek, vice-president of the Johns-Manville, Incorporated, New York, died suddenly on May 24 at White Sulphur Springs, W. Va. He has been recuperating from an attack of rheumatism. Mr. Meek was born at State College, Pa. He served seven years with the Pennsylvania Railroad at Altoona, Pa., shops, later going to Denver, Colo., in 1888, remaining there for six years, the last three of which he was chief engineer of a power plant. Mr. Mack entered the employ of the H. W. Johns Company, New York City, in 1894

and went with the new organization of the H. W. Johns-Mansville Company in 1902. He formed the railroad and United States government departments of this company in 1906, and held the position of general manager of same until March, 1924, when he was promoted to vice-president, retaining direct supervision of these departments in addition to other duties. Mr. Meek was also a director of Johns-Manville, Incorporated. He was a member of a number of clubs, including the Engineers' Club and the New York Railroad Club.

Max Riebenack, formerly mechanical and research engineer of the National Amoline Chemical Company and the Industrial Separators Company, Philadelphia, Pa.; and **Ben W. Beyer, Jr.,** formerly sales engineer of the Union Special Machine Company, Chicago, have been appointed district sales engineers of the Industrial Works, Bay City, Mich., with headquarters, respectively, at Philadelphia, Pa., and New York City.

L. N. Whitcraft, for the last eight years field engineer of the Portland Cement Association, has been appointed district engineer in charge of the Philadelphia office, 1315 Walnut street. Prior to his appointment as field engineer Mr. Whitcraft was in charge of the Portland Cement Association work in New Jersey and prior to that was county road engineer for Somerset County, Md., and chief engineer of the hydrated lime bureau of the National Lime Manufacturers' Association.

George A. Nicol, Jr., eastern manager of the railroad department of **Johns-Manville, Inc.,** New York, has been appointed general manager of the railroad and government departments, with headquarters at New York; **J. C. Younglove,** western manager of the railroad department, has been appointed assistant general manager of the railroad and government departments with headquarters at Chicago. Mr. Nicol was born in Providence, R. I., and was educated at Mount Pleasant Academy, English High School and Rhode Island School of Design. He served a special apprenticeship at the Rhode Island Locomotive Works, and was then employed as a locomotive designer with the American Locomotive Company, going to Louisville, Ky., in March, 1904, with the Louisville & Nashville as locomotive designer and later specializing in car design. In August, 1905, he went to the Baltimore & Ohio as designing engineer in the mechanical department at Baltimore, Md., remaining with the Baltimore & Ohio until January 1, 1909, at which time he entered the employ of the H. W. Johns-Manville Company, as railroad representative. In 1912 he was transferred to the executive headquarters of the company in New York as eastern assistant manager of the railroad department and in 1920 was promoted to eastern manager of the railroad department. Mr. Nicol was elected a director of Johns-Manville, Inc., in 1921, holding the position of eastern manager until his present appointment, as above noted. Mr. Younglove was born on August 7, 1878, at Crescent, Saratoga county, New York, and was educated at Armour Institute of Technology, Chicago. For two years after entering business he was connected with the National Lead Company at Chicago and for the past 23 years with the railroad and government departments of Johns-Manville, Inc., where he has worked up to the position of western manager, which position he held at the time of his recent promotion. In 1921 he was also elected a director.

George A. Nicol, Jr. J. C. Younglove

Trade Publications

Manganese Steel.—The Taylor-Wharton Iron & Steel Company, Philadelphia, Pa., has issued a booklet entitled "Putting the Right Steel on the Job," which is primarily prepared to furnish information with regard to the quality of Tisco steel. The booklet also furnishes historical information concerning the Taylor-Wharton Iron & Steel Company and details the various equipment of its mills and products of manufacture.

Oil Storage.—The S. F. Bowser Company, Inc., Ft. Wayne, Ind., has issued a new catalog of its equipment with illustrations and specifications on its railroad storage and distributing systems for naptha, gasoline, paint, oils, varnishes, shellac and other liquids. Full specifications are given for each type of equipment considered which includes pumps, meters, locks, hose and other accessories or connections. The catalog is arranged for purposes of design as well as for purchasing.

Air Lift Pumping.—The Sullivan Machinery Company, Chicago, has issued a new booklet on air lift pumping equipment which is both a catalog of equipment and a handbook of practice. The booklet develops the application of air lift pumping to various problems encountered in well supplies and is illustrated both with drawings of mechanical and engineering details and with photographs of typical installations. Included in the book are specifications of the various lines of equipment furnished by the company, as well as general data of value to water supply designers.

Cinder Plants.—A publication has been issued by William Robertson & Company, 509 Great Northern building, Chicago, devoted to a description of the Robertson cinder conveyor, as improved, also the Robertson coal conveyor and various sand handling equipment, all operated by air. The reading matter comprises information as to the advantages of the equipment, also information on installation, operation and maintenance. Sketches are furnished to show the methods of installation, also various photographs of the equipment in service and a collection of data on operating costs.

Maintenance Reclamation.—A small pamphlet, 8 pages, illustrated, on maintenance of way reclamation by the oxy-acetylene process has recently been issued by the Air Reduction Sales Company, New York. The possibilities of this process of welding are discussed in addition to outlining the economies which can be effected. Considerable information is included on the costs of operations for welding frogs, building up rail ends and switch points and for bonding rail, this information being based on a large number of observations on different roads and under practical conditions.

Herbicide.—The Reade Manufacturing Company, Jersey City, N. J., has recently issued a large size, 16-page, illustrated booklet on the chemical method of track weeding as used by this company in the application of its weed exterminator known as Herbicide. The text of the booklet includes a detailed description of this company's method of treatment; the equipment, manner of shipping, types of contract and other information relative to the subject. The illustrations show the various results which have been obtained and the class of equipment which is used.

No. 2 Convertible.—The McMyler-Interstate Company, Cleveland, Ohio, has recently issued a large size, 32-page, illustrated booklet describing its No. 2 convertible crane and steam shovel. The unit, which is described and illustrated in detail, consists essentially of a hoisting mechanism with two power drums and a boom hoist with which either steam, gasoline or electric power can be used. The unit is arranged for mounting on crawler treads, stationary base for gantry work, tractor wheels, and on railroad and ditcher carbodies for all classes of crane work. It is also designed for conversion in the field to a complete steam shovel with boom, dipper stick and crowding mechanism, etc.

Buyers' Guide

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Acetylene, Dissolved.
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Ingersoll-Rand Co.
Sullivan Machinery Co.

Air Hoists
Ingersoll-Rand Co.
Sullivan Machinery Co.

Air Lift Pumping Systems.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Anchors, Rail.
Lundie Engineering Co.
P. & M. Co.

Anti-Creepers, Rail.
Lundie Engineering Co.
P. & M. Co.

Apparatus, Brazing, Welding and Cutting, Heat Treatment.
Air Reduction Sales Co.

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Lehon Co.

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Western Wheeled Scraper Co.

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Mudge & Company.

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Blaw-Knox Co.

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Cars, Dump.
Clark Car Co.
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Cars, Industrial.
Clark Car Co.
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Cars, Motor Section.
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Buda Co.
Fairmont Railway Motors, Inc.
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Industrial Works.

Creosoted Timber.
International Creosoting & Construction Co.
Long-Bell Lumber Co

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Rowe Manufacturing Co.
Long-Bell Lumber Co.

Fence.
Cyclone Fence Co.

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Diamond State Fibre Co.

Filters.
American Water Softener Co.

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Murdock Mfg. & Supply Co.

Hydrants, Fire.
Murdock Mfg. & Supply

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Regulators, Oxy-Acetylene.
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Removers, Paint and Varnish.
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Structural Steel.
Bethlehem Steel Co.

Sublimed Lead, Blue, White
Eagle Picher Lead Co.

Switches.
Bethlehem Steel Co.
Buda Co.
Frog Switch & Mfg. Co.
Kilby Frog & Switch Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

Switch Locks.
American Valve & Meter Co.

Switchstands and Fixtures.
American Valve & Meter Co.
Bethlehem Steel Co.
Buda Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

Tampers, Tie.
Ingersoll-Rand Co.

Tanks, Water Storage.
Chicago Bridge & Iron Works

Tanks, Elevated Steel.
Chicago Bridge & Iron Works

Tanks, Oil Storage
Chicago Bridge & Iron Works

Tank Valves
American Valve & Meter Co

Tapes
Lufkin Rule Co

Tee Rails.
Bethlehem Steel Co.

Telegraph Poles
International Creosoting & Construction Co.
Long-Bell Lumber Co.

Ties.
International Creosoting & Construction Co.
Long-Bell Lumber Co.

Tie Plates.
Bethlehem Steel Co.
Lundie Engineering Corp.

Tie Rods.
Bethlehem Steel Co.

Tie Tampers.
Ingersoll-Rand Co.

Tie Tongs.
Maintenance Engineering Corp.

Timber, Creosoted.
International Creosoting & Construction Co.
Long Bell Lumber Co.

Tool Steel.
Bethlehem Steel Co.

Tools, Oxy-Acetylene Welding and Cutting.
Air Reduction Sales Co.

Tools, Wrecking.
Industrial Works.

Tongue Switches.
Bethlehem Steel Co.
Buda Co.
Frog Switch & Mfg. Co.
Kilby Frog & Switch Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

Torches, Oxy-Acetylene Welding and Cutting.
Air Reduction Sales Co.

Track Barrow.
American Trackbarrow Co.

Track Drills.
Buda Co.
Ingersoll-Rand Co.

Track Insulation.
Diamond State Fibre Co.

Track Jacks.
Buda Co.
Co.
Idol Track Liner Co.
Verona Tool Works.

Track Liner.
Idol Track Liner Co

Track, Portable.
Western Wheeled Scraper Co.

Track Tools.
Buda Co.
Verona Tool Works.

Transfer Tables.
Industrial Works.

Treating Plants, Water.
American Water Softener Co.

Vacuum Pumps.
American Well Works.
Goulds Mfg. Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Warning Devices — Bridge and Tunnel.
Hastings Signal & Equipment Co.

Washers, Fibre.
Diamond State Fibre Co.

Water Column.
American Valve & Meter Co.

Water Crane.
American Valve & Meter Co.

Water Softening Plants.
American Water Softener Co.

Water Treating Plants.
American Water Softener Co.

Water Tanks.
Chicago Bridge & Iron Works.

Water Treating Tanks.
Chicago Bridge & Iron Works.

Waterproofing Fabrics.
Lehon Co.

Welding, Oxy-Acetylene.
Air Reduction Sales Co.

Wharf Cranes.
Industrial Works.

Wheels, Hand and Motor Car.
Buda Co.
Fairmont Railway Motors, Inc.
Mudge & Co.

Wire Fencing.
Cyclone Fence Co.

Wood Grapples.
Industrial Works.

Wood Preservation.
International Creosoting & Construction Co.
Long-Bell Lumber Co.

Woodworking Machnery.
American Saw Mill Machinery Co.
Long-Bell Lumber Co

Wrecking Cranes.
Industrial Works.

Wrecking Tools.
Industrial Works.

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